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ABSTRACT

This publication is intended to develop a baseline publication on the quality of human environment and is designed to point out some crucial issues that must be considered in relation to the environmental management issue. Part I includes four articles. The first suggests man's role in relation to ecological science. The second is study of the technological aspects of the quality of human environment. The third is overview of the economic implications of environmental policy. Part I concludes with an article on the preparation for environmental education providing a basic guideline for environmental education and emphasizing a "whole world" approach to learning. Part II contains three articles setting out the present and future possibilities in environmental education. Part III is "The Environmental Crisis and Education: An Epilogue." Extensive bibliographies, references, list of resources, source materials, and appendixes are included. (MJM)

ED 067392

IN DEFENSE OF MAN: EDUCATORS AND ENVIRONMENTAL ACTION

Joel L. Burdin and Francis X. Sutman
Editors

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Dr. Roger F. Bauer
Chairman, Education Foundations and Secondary Education
University of Wisconsin-Stevens Point
Stevens Point, Wisconsin 54481

Dr. Joel L. Burdin
Director, ERIC Clearinghouse on Teacher Education
Associate Director, AACTE
One Dupont Circle
Washington, D.C. 20036

Dr. James Carpenter
Head, Oceanography Section
National Science Foundation
1800 G Street NW
Washington, D.C. 20550

Dr. J. D. "Jack" DeForest
Senior Environment Economist
Office of Environmental Affairs
U.S. Department of Commerce
14th and Constitution NW
Washington, D.C. 20230

Dr. Lee Dreyfus
Chancellor
University of Wisconsin-Stevens Point
Stevens Point, Wisconsin 54481

Dr. Arthur L. Fritschel
Dean, College of Professional Studies
University of Wisconsin-Stevens Point
Stevens Point, Wisconsin 54481

Dr. Helen Hayes
Scientific Assistant to the Assistant Secretary for Science
Smithsonian Institute
1000 Jefferson Drive
Washington, D.C. 20560

Dr. Walter J. Mars
Associate Director, AACTE
One Dupont Circle
Washington, D.C. 20036

Dr. James Newman
Assistant to the Dean of Natural Resources
University of Wisconsin-Stevens Point
Stevens Point, Wisconsin 54481

Dr. George O'Hearn
Executive Assistant to the Dean
University of Wisconsin-Green Bay
1567 Deckner Avenue
Green Bay, Wisconsin 54302

Mrs. Kay Shoemaker
Program Assistant, AACTE
One Dupont Circle
Washington, D.C. 20036

Mrs. Patricia Sparks
University Fellow
Temple University
Philadelphia, Pennsylvania 19122

Dr. Edward Stanley
President, Teacher Guides to Television, Inc.
145 East 69th Street
New York, New York 10021

Dr. Francis X. Sutman
Associate Chairman
Division Curriculum and Instruction
Temple University
Philadelphia, Pennsylvania 19122

FOREWORD

How can the total society defend man as he approaches the last quarter of the Twentieth Century? Trapped by uncontrolled and low quality sound, air, water, and waste, modern man requires the help of diverse professionals and technicians if he is to achieve a quality environment and survive.

A group of professionals was convened by the ERIC Clearinghouse on Teacher Education in collaboration with the American Association of Colleges for Teacher Education and the Department of Commerce to develop a baseline publication on the quality of human environment. The views expressed do not necessarily reflect those of the Clearinghouse or its three sponsoring organizations, the AACTE as a conference sponsor, or the Department of Commerce. Discussants considered "what and so what" questions and alternatives of environmental education. They brought diverse training, experiences, competences, and perspectives: scientific, technical, education, and teacher education. It was a task oriented group: preparing a publication which would be substantively sound and educationally useful. This publication was not designed to create experts in environmental education, but rather to point up some of the crucial issues that must be faced when considering environmental management.

The writers' conference provided an opportunity for persons from varied disciplines to listen to presentations--criticize and suggest changes--to share analyses and interpretations of critical issues and alternatives, and to synthesize ideas and information. It allowed critical input and interaction which led to broad syntheses and interpretation. Each participant rejected simplistic "solutions" to environmental crises. Each tended to think about the *beginnings* needed to reverse long-term abuses of natural and man-generated resources and capabilities. Further, each thought in terms of the big picture--scientific and technical, education for students, and teacher education. Everyone recognized the imperative of redefining societal values, objectives, and lifestyles compatible for the good for most people.

Steps included in producing this publication for national distribution were (a) critical review and suggestions for improving the working draft by participants at AACTE School for Executives, August 20-26, 1972; (b) further refining by writers' conference participants, sponsors' staffs, and editors based upon input from the School for Executives; (c) publication of the refined document.

AACTE has a strong and continuing interest in environmental education. Examples include Annual Meeting sessions on the topic and sponsorship of an AACTE-Organization of American State Conference on "Education on the Environment in the Americas." The proceedings were published in English by AACTE under the title of *What Kind of Environment Will Our Children Have?* (1972, 92pp.) and are scheduled to be published in Spanish by the Organization of American States in its publication, *Educacion*.

Dr. Sidney P. Galler, Deputy Assistant Secretary of Commerce, has played an important role in the identification of major contributors and in planning follow-up activities. The cooperation of the Clearinghouse, AACTE, and Department of Commerce, and University of Wisconsin-Stevens Point illustrates needed pooling of resources to create a higher quality environment. The University served as a perfect host for the Conference; its staff and students provided excellent input. Acknowledgment is due particularly to Chancellor Lee Dreyfus and Dean of Professional Studies Authur L. Fritschel. Future cooperative activities are being planned at the time of this writing.

Recognition is due AACTE staff members Ms. Kay Shoemaker and Ms. Diane Bartosh who handled arrangements for the participants prior to and during the conference. Additionally we acknowledge Ms. M. Donley and Ms. C. Pazak for their editorial assistance in preparing the manuscript.

You may do further research on this topic by checking issues of *Research in Education* (RIE) and *Current Index to Journals in Education* (CIJE). Both RIE and CIJE use the same descriptors (index terms). Documents in RIE are listed in block according with the ERIC Clearinghouse on Adult Education (AC) and ending with the ERIC Clearinghouse on Vocational and Technical Education (VT). The clearinghouse code letters, which are listed at the beginning of RIE, appear opposite the ED number at the beginning of each entry. "SP" (School Personnel) designates documents processed by the ERIC Clearinghouse on Teacher Education.

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For readers uncertain how to use ERIC capabilities effectively, we recommend the following materials which are available in microfiche and hardcopy through the ERIC Document Reproduction Service: (a) How To Conduct a Search Through ERIC, ED 036 499, microfiche, 65¢; hardcopy, $3.29; (b) Instructional Materials on Educational Resources Information Center(ERIC). Part Two. Information Sheets on ERIC, ED 043 580, microfiche, 65¢; hardcopy, $3.29. Item "b" is available as a complimentary item, while the supply lasts, from the Clearinghouse on Teacher Education.

In fairness to all participants, it is important to report that the total time available to develop this publication was very short - a situation created by plans to obtain critical input from the 1972 School for Executives and to provide time to refine the document for use in some fall conference activities now in planning stages.

--Joel L. Burdin, Director
ERIC Clearinghouse on Teacher Education

--Edward C. Pomeroy, Executive Director
AACTE

ABSTRACT

These articles are intended to develop a baseline publication on the quality of human environment. The publication is designed to point out some crucial issues that must be considered in relation to the environmental management issue. Part I--"Perspectives from Selected Disciplines"--includes four articles. The first article, "The Place of Man in Ecology," suggests man's role in relation to ecological science. A study of the technological aspects of the quality of human environment presents the extent to which the environment satisfies present human needs and the possibilities open to technology to improve the environmental situation. An overview of the economic implications of environmental policy presents practical concerns for the development of public policies to achieve low cost solutions consistent with technical progress. Part I concludes with an article on the preparation for environmental education providing a basic guideline for environmental education and emphasizing a "whole world" approach to learning. Part II contains three articles setting out the present and future possibilities in environmental education. Society and communications, an integral part of development, is studied in relation to the environment. The need for environmental education experiences in the school curriculum and teacher education programs is stressed in the article entitled "Environmental Education: A Move to Action." The final article, "The Concerns of Education for Human Ecology," reemphasizes the need for concern in terms of the children taught. Part III is "The Environmental Crisis and Education: An Epilogue." Extensive bibliographies, references, list of resources, source materials, and appendixes are included.(MJM)

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TOPIC:

DESCRIPTORS TO USE IN CONTINUING SEARCH OF RIE AND CIJE:

Consumer Economics
*Ecology
*Environmental Education
*Environmental Influences
*Environmental Research
*Social Responsibility
Teacher Education
Technological Advancement

*Asterisks indicate major descriptors.

Part I

PERSPECTIVES FROM SELECTED DISCIPLINES

THE IMPORTANCE OF PUBLIC UNDERSTANDING OF ECOLOGY

By

Helen Hayes
Smithsonian Institution

Ecology is the science of the environment. It is a composite science based on knowledge from all the physical and biological sciences and has as its goal, an understanding of the interrelationships of all the factors operating in and making up the environment. Although ecology is an old science, modern ecology was greatly enhanced by the advent of the computer. So many factors have been discovered which play important roles, that the human brain can neither collect nor integrate all the information relating to their influence on one another. Of course, the computer cannot formulate ideas; it is simply a bank for raw data and a rapid organizer. It is useful especially in the making of models for testing hypothesis.

Man plays many roles in his environment. On one hand, he is an animal; one of the populations in a community, affecting the others and being acted upon, not only by other organisms, but by all parts of the environment. On the other hand he is a very potent, moving force because his intellect gives him powers to modify his surroundings to a much greater extent than can other animals. If the ways in which he modifies his surroundings are not to lead to his extinction or his degradation, he must learn about this very complex system. Not only must the specialist be trained--our lack of knowledge is enormous and even the extent of the lack is unknown--but also the non-specialists--the general public, government administrators, planners, and policy-makers. They play at least as important a role as the scientists. One group without the other is impotent. The research is futile if the planners and the public are not willing to accept and utilize scientific findings.

I propose the following as primary goals of general education in ecology:

1. To make the public aware of the interrelationships existing in the world's ecosystem and educate it to think in terms of those relationships.

2. To give the public a basis on which to make value judgments about statements in the media so he can distinguish between feasible plans and propaganda and be motivated to seek further information.

3. To encourage the development of responsible and rational citizens who will think and vote intelligently on environmental policy matters.

4. To prevent confusion and discouragement in the face of the system's complexity.

5. To dispel emotionalism.

6. To recognize how worsening environmental problems especially overpopulation can lead to and have led to the erosion of political and personal freedoms.

7. Elucidate the need for increased research and technological development and so to encourage students to enter scientific fields and encourage government to support and utilize scientific research results.

Key Concepts in Ecology

The traditional methods of problem solving taught in other sciences--the isolating of the elements of a problem while assuming that all other factors remain static--is not appropriate to ecology. Here all factors interrelate dynamically. Barry Commoner's First Law of Ecology is "Everything is connected with everything else." A convenient hierarchy in ecology begins at the *individual*, who is a part of a *population* of other individuals of the same species. A group of naturally occuring populations forms a *community* which, with other communities and with their non-living environments, comprise a geographically limited *ecosystem*. This is the level at which the impact of man's activities is likely to have the most far-reaching effects. It is the level of the governmental planners.

> The ecosystem is the community plus the nonbiological parts of the environment--that is to say, the inorganic chemical components of the environment and such physical factors as temperature and light. The community strongly affects the character of the environment in which it lives. In a lake, the development of a algae reduces the concentration of scarce nutrient elements, affects the penetration of light into the lake, and thereby affects the temperature of the upper water. Thus, a detailed study of the chemical and temperature conditions of the lake cannot be made without some measurement of the biological conditions also present. An essential point to understand here is that the whole system responds. A direct effect of an environmental change on one part may feed back to cause other parts of the system to make readjustments in activity or abundance. *[Handler; 1970:732]*.

Self-regulation of the system to maintain or attempt to reach a balance is another important force. In the case described by Handler, if the algae grow beyond a certain limit, they will change the water conditions to the point that the water becomes toxic, thus reducing the algae population. At the same time, decomposition of the algae will return the scarce nutrients, and the lake will revert to an approximation of its former condition. (Other factors will, of course, have been acting in the meantime, so a complete return is unlikely.)

Commoner's second law states that "Everything must go somewhere." This is a simplification of the first Law of Thermodynamics which deals with the conservation of energy. In other words, there is no waste in nature. Biologists have been able to show the cycling of energy through the "food-chain" as well as the flow of energy through the non-living parts of the ecosystem. The primary source is the sun. This is utilized by green plants in photosynthesis. The green plants provide food for the herbivores which, in turn, are eaten by carnivores. Bacteria and other forms break down decaying matter and return the chemicals to the soil. Some of the energy is lost as heat which returns ultimately to the water or the atmosphere. Respiration and transpiration cycle the oxygen and carbon dioxide, and so on. The details are to be found in any textbook. The cycle is the key point.

Time as an element in the ecosystem is often not recognized. Organisms behave differently at different stages of life cycles, for example. They may even inhabit different habitats, e.g., larvae of mollusks in the surface waters; adults on or in the bottom sediments. Diurnal rhythms, tidal cycles, seasonal changes, and cicadian rhythms all modify the interactions. Rates of change also vary. Organisms die out if changes occur too rapidly; they might, however, be able to adapt to slower movements. Cataclysmic changes in nature are rather rare, and when they occur, they are often local and short-lived. Diversity and homeostatis permits survival of a good proportion of the biota after storms, volcanoes, earthquakes, droughts, etc. Human activity, on the other hand, is usually much more rapid, long-lasting, widespread, and drastic. Balances are exceeded and there is no time for recovery. This brings us to another of Commoner's laws, "There is no such thing as a free lunch." Man disturbs the natural balance at his peril. He has done so in the past, but to a small extent. From the first use of agriculture, he reduced the natural diversity of the land by concentrating on single crops. The Indians in America burned the prairies to improve the soil and to drive the buffalo. Modern man is much more thorough. His one-crop farming covers tremendous areas. It requires that the soil nutrients be replaced regularly, that the pests be eliminated, and even that the weather be modified. Of course, such an artificial system is vulnerable when change occurs. Drought, parasites, disease, or any sudden change can wipe out the entire crop. Weed killers and pesticides are often refined to the point where they can no longer

be absorbed into the cycle. Sometimes man must take a calculated risk or make a choice of bad alternatives. DDT, for example, while enormously useful becomes a pollutant because it is not metabolized. It is accumulated in the bodies of the animals of the food chain to a level well beyond safe limits.

Other animals, for a variety of reasons, may become too populous. They starve after depleting their food supply, become prey to disease, parasites, and behavioral abnormalities including decrease in reproductive capabilities. Thus, the size of the population is controlled. Because of his medical and other technical advances, man has avoided these drastic results thus allowing him to overreach. This is especially so in America. The quality of his life, however, is rapidly deteriorating, and his political and personal freedoms are already eroded. Even when his numbers are not excessive, his congregating in cities and his demands for high living standards add greatly to the stress he is putting on his environment. His food must be brought in from the country. In order to stand the journey, it must be treated with preservatives; these may interfere with the disposal of the waste material. At least, the wastes are not returned to the soil; at worst, they accumulate and pollute the water and air. Man's very efficiency compounds his problems.

To quote Commoner again, "Our ability to intrude on the environment outstrips our knowledge of the consequences." While this is undoubtedly true, the answer lies in increasing our knowledge, not in reducing our efficiency.

There are some who feel that man must eschew all the benefits of technology and go back to nature. This approach is surely unrealistic. Man is not prepared to abdicate his position. Instead, he must recognize the effects of his actions and develop his technical powers to relieve the strains his valid requirements engender.

The goals of ecological science are understanding, prediction, and control. Research scientists who study the nature of the interactions in the environment and who develop principles of ecology can help us understand the workings of this very complex balance. Others who monitor, measure, weigh, and count entities of all kinds make it possible to compare conditions and to recognize trends, long-period cycles, and other indications which help discern subtle changes and which permit interpretations of causes and effects. Realistic and accurate prediction must be based on these kinds of data. Lastly, we need technology to help us control the influences of our intrusions.

Commoner's third law, "Nature knows best," makes the point that man-made modifications are likely to be detrimental. I believe he is unnecessarily pessimistic. Informed and expert man may yet be able to rescue himself from the dangers his ignorance has led him to.

Thought Questions on Ecology

1. Human succession and principles of ecology is taught usually within the context of biology and should it also be emphasized in environmental education activities?

2. Can teachers in training deal with the use of the computer in predicting ecological results without first becoming familiar with computer technology and theory?

3. How do you teach students and teachers to both trust scientists and to question them?

4. Scientific and environmental education jargon to the young is like learning a new language. How do you control or overcome this obstacle?

Bibliography

Handler, Philip, ed. Biology and the Future of Man. New York: Oxford University Press, 1970.

QUALITY OF HUMAN ENVIRONMENT: TECHNOLOGICAL ASPECTS

By
James H. Carpenter
National Science Foundation

Perspectives on the role of technology begin with particular concepts of "quality." The extent to which our environment satisfies human needs might be one basis for evaluating environments, and such a view leads immediately to recognition that quality is a continuum with perfection at one end and utter wretchedness at the other. The varieties of human needs range from inherent physical, psychological, and spiritual characteristics of all people to the temporary fads and artifacts of various cultures and social systems. The notion that technology would lead to near perfection in meeting the whole spectrum of human needs seems silly, yet the statement that technology has failed is made frequently. Technology is an essential part of the answers to the problems of improving the quality of human environment, but it is not *the* answer.

Many of the principles that have been established through scientific research are generally applicable to environmental problems and our daily lives. Unfortunately, our educational processes have not included efforts to develop appreciation of the "relevance" of basic scientific knowledge. Principles are taught in science courses and illustrated in laboratory courses with perhaps the impression that such knowledge is primarily applicable only in the environment of the laboratory. It is appalling that many individuals who identify themselves as "conservationists" appear to act in ignorance of the principle of conservation of matter. This is one of the most general scientific principles with applicabilty to every physical situation, and education should lead to invoking it almost automatically in assessing the physical aspects of our environment. Such questions as "Why in this atomic age can not we have sewage treatment plants with no effluents or solid residues?" seem strange when they are raised by people that have participated in the United States educational program.

General principles from biology seem to be useful. Biological life is the flow of energy and material. A part of scientific ecology is preoccupied with the description of natural systems in terms of energy flow. The producers use energy from the sun to produce chemical compounds with greater chemical energy content than the starting materials. The primary consumers depend on the producers for their energy source and secondary consumers depend on consumption of the primary consumers. The concepts of the food (energy) webs and trophic levels arise from conservation considerations and are the framework for quantitative ecology. The local intensity of the energy flow determines the carrying capacity of that part of the environment. This characteristic is sometimes described nonnumerically with words such as eutrophic (good-nourishment) or dystrophic (poor-nourishment). These general concepts have innumerable applications in environmental quality problems.

Scientists, engineers, and technologists are sometimes considered unimaginative because their considerations are constrained by the concepts of conservation of material and energy. However, miracles are admissible only in the spiritual domain. Some of the current serious concerns for human environment are based on conservation considerations and appear to be valid. The current interest in environmental problems should not be allowed to become a passing fad. The problems are real, and education should develop a realistic appraisal of problems and possible partial solutions to the problems.

Evaluation of environmental questions requires an understanding of how natural systems function and an understanding of how artifical systems operated by man may function. Understanding is a necessary adjunct to emotion for effective action. It is frequently stated that emotionalism should not be a major part of decisions, but it probably is more accurate and useful to consider that emotion is not a substitute for thought. One can be angry, fearful, disgusted, joyful, or surprised during the computation of a budget, whether it relates to household finances or the energy supplies of the United States. Educational programs should aim at developing aptitudes for rational analysis to be coupled with enthusiasms in considering environmental problems.

There is considerable danger associated with emotionalism if it masks the basic requirement of setting priorities in considering a group of environmental problems. Questions of air and water quality ultimately degenerate into issues of what portion of the limited resources of human energy and money should be devoted to maintenence of any particular air and water quality characteristics. False and unrealistic goals may be developed if fear and anger dominate the setting of these goals, and neglect of some problems may be justified in order that adequate attention be given to those with higher priority. Public debate is essential for finding priorities, but emotional prejudices should not pollute such efforts. As Dr. Larry Ruff points out in a recent essay (Ruff, p. 74), "If we can go to the moon, why can't we elimiate pollution? This new, and already trite, rhetorical question invites a rhetorical response: If physical scientists and engineers approached their tasks with the same kind of wishful thinking and fuzzy moralizing which characterized much of the pollution discussion, we would never have gotten off the ground." However he does not choose to discuss the most subtle and difficult question of how the moon trips were identified as having high priority and which other needs should be neglected.

There are negative aspects of scientific knowledge and technology that need to be examined as part of the educational process. As our understanding of the physical world and the biological processes increases, so does our ability to alter or manipulate it increase. While the advances in nuclear physics that lead to the development of atomic weapons and possible consequences have been extensively publicized, the developments of chemistry leading to antibiotics against human disease, herbicides, and pesticides (i.e., partially selective toxi-

cants) may be equally significant. The need to assess the implications of new knowledge and technology puts a continuous strain on our lives. The whole time frames for possible substantial changes in our physical environment and our ways of living are shrinking as consequences of technological developments and lack of historical precedents is intimidating. At the same time, use of technology requires commitment to a sustained course of action for extended periods of time; for example, it takes roughly eight years from the time a site is selected to the production of electricity at a modern power station. Parts of technology creep up on us and other parts are frustratingly slow in development and application.

There has been some recognition that "environment" involves everything, as identified in the program definition of the Environmental Education Studies Staff, USOE. Environmental education is not identified as a new subject to be added to the curriculum, but is considered part of history, economics, sociology, mathematics, music, religion, resource management, etc. However, it may be questioned if suitable environmental awareness can be developed in the context of the normal course structure. Many of the real world decisions that effect environmental quality are made at the state, county, or municipal governmental levels and the value of those decisions would be a suitable educational topic. Even in the abstract, comprehensive considerations of the most desirable development of environmental systems to support human life at the community level would form a suitable program. Consideration of a piece of the physical landscape with its associated terrestial and aquatic ecosystems and the requirements of humans for homes, food, and jobs would face the student with many environmental questions. Land use planning is the occupation of professionals, but a knowledgeable public is essential if county or regional plans are to be accepted and carried out. Noise levels, air quality loss, water quality loss, and solid waste disposal impacts are amenable to technological abatement at various costs but site selection for various activities can be extremely useful in maintaining environmental quality. The whole spectrum of requirements must be identified and the effects of choices relative to one environmental factor should be tested for their simultaneous effects on other factors.

The almost endless series of questions relative to environmental quality need to be raised if simplistic, ineffectual approaches are to be avoided. Bans, prohibitions, and arbitrary standards are inefficient and, if applied without qualifications, intolerable. Current trends toward prohibiting mineral extraction such as gravel or sand mining, coal mining, and oil or gas well drilling are obviously not the long term solution to total system requirements for supporting quality human environment. Indication of willingness to share the cost of performing these activities with acceptable environmental changes is probably the first step.

The recent local bans on phosphates in detergents amount to imposing a particular technology. Economists suggest that a more

effective strategy would be an arbitrary tax or price increase for phosphate detergents, since this would allow personal cleanliness while providing incentive for finding substitutes for phosphates in detergents. The function of such taxes must be understood if they are to win public acceptance and such considerations are part of environmental education. The recent acceptance of the environmental costs of the use of DDT in the form of a ban could have been achieved with an abitrary tax, say $25 per pound, and permitted the homeowners to save their dogwood trees from borers while denying it to the large agriculture users. The retention of individual choice with incentives in the economic system appears to be quite attractive.

However, identification of taxes or prices as an efficient environmental quality control mechanism only makes knowledge of our environment more valuable. Understanding based on objective evaluation becomes a paramount need if appropriate prices are to be set. The phosphate case might be considered. An average group of one million people emits four tons of phosphate per day in their waste waters. Approximately one half of the total phosphate comes from the use of detergents. If the phosphates are not removed from the waste water, the local river, lake,or estuary will be loaded with four tons of phosphate per day. If the natural water flow is high enough, the phosphates might be beneficial. However, inadequate dilution in other cases leads to excessive algae production and loss of fishery and recreation resources.

The physical setting is obviously important. The Potomac River of Washington, D.C., has inadequate flow to dilute the phosphate wastes from the metropolitan region. With 2.5 million people in the region, roughly ten tons of phosphate enter the river each day. The observed phosphate concentrations are ten to twenty times the levels that are compatible with fishery and recreational use of the river. Removal of detergent phosphates would produce phosphate levels five to ten times those needed; i.e., the problem would not be solved, but the stretch of river that is substantially degraded might be reduced from sixty miles to thirty miles.

Would a phosphate ban be a partial solution? If the present intensity of laundering activities continued, and a new material were substituted for phosphates, the new material would appear in the river at the rate of ten tons per day if it were as effective a cleansing agent as phosphate and, if only half as effective, the river loading would be twenty tons per day. It seems reasonable to question a ban until the proposed substitute has been identified and the effect of the new substance on aquatic systems been evaluated with research that will require several years. Impatience is not compatible with serious approaches to improvement of environment, but can enthusiasm and interest be sustained without a serious educational program?

As noted above, even if laundering in metropolitan Washington were terminated in some magical way, the river would still be overloaded

with phosphates. There are technological processes for treating waste, water and some of these are effective in removing most of the phosphates. It is important to note that complete removal is not necessary and zero effluent volumes are not required, contrary to the implications of some bills pending before the Congress of the United States. The concentration in the discharge pipe is not of concern and effluent standards are not the appropriate consideration. The technolgies for removing phosphates have not been applied because public acceptance of increased sewerage charges has been uncertain. Recently the major investments ($500million dollars) have been committed and adequate phosphate as well as nitrogenous and carboneous compound removal is expected within a few years, with an annual cost of roughly $10 million dollars.

The cost of removing phosphates can be charged on the sewerage bill, but this procedure provides no incentive to use phosphate detergents conservatively as the direct relationship between cost and use will not be obvious to the user. A direct tax on detergents used in a particular region could be more efficient. The tax rate should be region specific; for example, Los Angeles with an ocean outfall into a system that is more nitrogen limited than phosphate limited might not need phosphate removal or a detergent tax. The need for a scientific basis for setting pollution abatement changes should be obvious. The purpose should not be punitive or whimsical and the public debate associated with levying such regional taxes should assure realism. One goal of education should be the development of a knowledgeable public to participate in such debates.

Thought Questions on Technology

1. Perhaps the questions of societal ethics, professional ethics, emotionalism control are the most crucial concerns. Are these questions for environmental education to deal with? If so, how?

2. Should education's concern mainly be an understanding of "quality," of the environment or a concern for the welfare of fellow man and the welfare of future generations?

3. Can education deal with individuals' aesthetic and/or psychological sense and its effect on decision-making?

4. How do educators deal with the question of when to use the principles of probability and when not to use them in decision-making?

Primitive Concepts

°Science and technology are an essential part of understanding and improving environmental quality. The fact that science and technology alone are not sufficient does not mean that scientific and technological consideration are not necessary.

°The physical and biological sciences provide the basic knowledge of how systems behave and of the responses of systems to natural and man-induced perturbations. Technology aids in performing man's activities and is the means for improving the quality of human environment.

°Environmental problems do not have static solutions. Problems must be identified; and the social, economic, and scientific dimensions, through their whole range, must be explored; and administrative, political, and technological mechanisms continuously developed and modified to produce dynamic solutions.

°An educated people will have the best chance of achieving environmental quality. Educational systems should be structured to produce environmental awareness and realistic goal-setting.

°Useful consideration of environmental problems depends on the application of intellectual skills. Knowledge of the concepts in sociology, economics, biology, and physical sciences will be needed in assessing solutions so that senior level (both high school and college) seminars may be the most effective in directing attention and producing some sophistication.

Bibliography

Ruff, Larry. "The Economic Common Sense of Pollution," Saturday Evening Post; Summer 1971.

ECONOMIC IMPLICATIONS OF ENVIRONMENTAL POLICY: AN OVERVIEW

By
J. D. "Jack" DeForest
U. S. Department of Commerce

Introduction

It is widely acknowledged that nature's capacity to assimilate the growing volume of wastes and effluents which are generated by population growth, industrial production, urban concentration, and mass consumption is increasingly limited in many geographical areas. The resulting environmental deterioration, while not a new development, has become a matter of serious concern as select pollution levels press on the threshold that society is willing and able to tolerate. Although much is not known about the magnitude of the hazards associated with escalating pollution, responsible observers recognize potential peril to the human condition if certain existing trends are not modified by improved management of the biosphere.

A growing public awareness of this situation has stimulated demands for action designed to insure that environmental deterioration will be limited to levels which are compatible with human health and aesthetic sensibilities. This mandate provides the underlying challenge facing decision makers, both public and private, for developing programs which will achieve a *rational balance* between the quality of life a society finds desirable and the required costs for environmental improvement.

It should be noted that declining environmental quality is *not* a price that must be paid in order to realize a rising standard of living. Instead, it must be stressed that a high quality environment (e.g., clean water and air, reasonable noise and congestion levels, etc.), along with leisure time and other "nonmaterial" variables, is an integral part of our living standard or well-being. Socioeconomic analysis cannot be concerned exclusively with tangible goods and services, but must consider human welfare *in toto*. Controversial policy issues, however, center on evaluating necessary "trade-offs" among the alternatives available for inclusion in the standard of living package. The subject must be approached within a framework which encourages effective allocation of resources (including "the environment") among competing end uses in order to maximize human welfare.

Background Economic Considerations

Though imperfect, our contemporary price-market system has served us well as a mechanism for allocating scarce resources in response to consumer demands. It is an excellent vehicle for guiding the behavior of both producers and consumers in our economy. Prices, which are determined by the interplay of supply and demand for a particular good or service, serve a dual purpose of rationing available resources and

signaling options among production-consumption alternatives. For example, as people demand more of a product, the price will probably rise and stimulate greater production in order to satisfy the expressed desire. In this way, individual preferences for both basic necessities and luxuries are reflected in the marketplace.

Unfortunately, the traditional "free" market mechanism has limited usefulness when dealing with important environmental considerations. Increasing evidence suggests that the system has "failed" when relied upon to determine the optimum choice between particular production-consumption patterns and their associated impact on environmental quality.

For many years, the seemingly inexhaustible supply of common property resources--including air and water-- has been treated as "free" goods and used accordingly. As a result of extensive exploitation, shortsighted actions have damaged some fragile natural systems to the point where environmental deterioration detracts from human welfare. In order to correct this situation, it will be necessary to insure that a price tag is put on increasingly *scarce* "environmental resources"--they are no longer "free." This means that they will take on a positive cost which will be included in the price of the final product whether it be municipal water, electricity, or a private automobile. In short, if one desires to use any scarce resource, it will have to be paid for in some fashion. In this connection, it must be recognized that conventional income accounting practices have important limitations as an accurate measure of human welfare, especially regarding the narrow view of environmental quality. For example, in order to get a true evaluation of well-being, some estimates should be made for the "negative" goods and services generated in producing the "positive" output which is measured. This exercise would involve evaluating such things as additional medical and transportation expenses, premature damage to capital goods, outlays for pollution abatement, and loss of natural areas, all of which are linked to economic growth and rising pollution levels. When evaluating these negative factors, the alleged virtues of constantly expanding national product statistics are somewhat diminished --at least in terms of human welfare. In short, there is an anti-environment bias built into statistical measures that can be attributed to traditional accounting practices.

Conventional cost accounting essentially ignores the damage to valuable "social goods" *including environmental quality*, when producers and consumers avoid paying for the *full* costs of production. The resulting *social costs* are called "spillovers," "diseconomies," or simply "externalities" by the economist. They contribute significantly to our ecological difficulties and the production costs for some goods. When the market does not take into account these *externalities*, their impact cumulates over time with increasingly obvious environmental deterioration.

Take, for example, the case of a paper manufacturer who will scrutinize his *internal* costs: payments to labor, interest, taxes, raw materials, etc., but (until recently) pays little attention to the waste products his plant dumps into the river. The understandable concern has been with the private or internal costs which are reflected in his income statement.

The social costs which his form has generated in the form of polluted water have no direct impact on the plant's operation. Accordingly, the final market price for paper will be, by definition, *artifically low* because it does not include adequate consideration of the environmental deterioration generated by the production process. The task facing public policy makers is to develop ways to insure that private cost calculus will include the *full* costs of production and not simply those which are internal to the firm.

In summary, accounting practices have been understandably narrow in scope and confined to ongoing *internal* economic activities of an enterprise (which, incidentally, could be a municipal waste water treatment plant). The resulting calculations have weakened or eliminated important incentives for encouraging the use of environmentally beneficial production methods and/or consumption patterns. To the extent this is true, market *prices are too low* and give a misleading cost of production "signal" in the marketplace; there is no computation for operating externalities. An important effect of neglecting consideration of relevant externalities is that some resources will be wasted (or under utilized) in terms of social welfare. This type of mis-allocation is reflected in the paper mill case cited above where the *real* costs of production would be understated. The resulting market price of paper would be artifically low, while the polluted water damages downstream fisheries which will in turn have higher costs and prices than would be the case if the paper mill was not operating. Society gets relatively too much paper and too little fish--consumers of fish in effect subsidize consumers of paper.

Once this sort of "market failure" problem is recognized and acknowledged, constructive remedial policies can be formulated which will provide necessary incentives for both seeking and implementing *new* technology that is geared to relatively less polluting production. In addition, pursuit of a "polluter pays principle" will necessarily influence production and consumption patterns because the *full* costs of production (including "social costs") will be reflected in final market prices. Although the producer will usually be able to pass most pollution control costs on to the ultimate consumer, higher prices will make some products less attractive in the marketplace. To the extent technological innovations cannot cope effectively with a polluting process or product, the resulting higher costs and prices will reflect how much consumers must pay in order to "enjoy" it.

Dimensions of the Problem

In introductory economics, the instructor typically points out that all societies, regardless of political make-up or stage of development, must deal with three basic questions: Among infinite alternatives, *what* is going to be produced? *How* will it be produced (fundamentally an engineering problem)? *For whom* or how will the product be distributed? Of course, economics, which is the science of choice, enters decisions at each of these three levels. How does this conceptual approach relate to environmental concern?

One might argue that the *What?* is reflected in the environmental *awareness* issue. It is a necessary first step to know something is wrong, but recognition of a problem is not an end in itself. With the aid of mass media, political activism ("the environmentalists"), earth days, and the UN Conference on the Human Environment (Stockholm, June 1972), etc., the public *knows* there are problems. At this juncture, the policy imperative is to avoid programming the *How?* by promoting naive and unworkable "solutions" which serve to prevent the realization of equitable *For Whom?* goals.

The really thorny areas require examination of how we approach the subject. For example, how do we measure ecological damage? How much pollution is hazardous? How do you develop reasonable abatement programs? How much will they cost? Or, who will benefit from environmental enhancement? Who will carry the burden of remedial program costs? In final analysis, *political* decisions will largely determine how these questions will be resolved--decisions hopefully predicated on a solid structure of scientific validity and economic practicality.

As any knowledgeable observer knows, few socioeconomic problems are or can be "solved." The goal is to seek a functionally desirable resolution to problems which is equitable to *all* involved parties. This outcome is especially important in the environmental area because naive emotionalism often generates more heat than light. The core of the difficulty centers on several fundamental limiting factors. First, consistent and reliable social cost estimates of production-consumption externalities are elusive. The task of pricing damages to the environment is imposing because relevant quantitative data are inevitably subject to value judgments and, therefore, exposed to challenge.

Second, there is the controversial human health *criteria* issue. Valid scientific information--at least concerning hazard thresholds--*is simply not available* regarding the linkage between human health and exposure levels to certain pollutants. This situation leads to extensive ambiguity in setting "reasonable" pollution control *standards* which are the targets for abatement action. Finally, even with the subjective limitations of standard setting, there is the problem of determining what is the best *practical* way for securing corrective actions despite information limitations. In order to deal with the pollution problem efficiently, a high priority effort must be made to improve the data base and analytic techniques which will serve as the information system for standard setting and other related policy decisions.

The need for valid health criteria to support "arbitrary" standard-setting cannot be over stressed. The costs a society must bear for setting unrealistic standards will be substantial in terms of wasted resources. It is especially significant for businessmen to have reasonable and consistent standards. At best, investment decision making is a hazardous undertaking. Ill-conceived pollution control standards in reaction to short-term political expediency compound this task unnecessarily.

It is important to keep in mind that the objective of pollution

abatement is to maximize the *net benefits for society as a whole*. In final analysis, environmental goals will have to be considered in light of general economic and other public policies. In this context, certain goal conflicts are likely to surface. A vigorous attack on polluting activities will raise production costs and increase prices for *some* products, at least in the short run, so environmental policies will likely have an inflationary bias. This naturally follows from efforts to incorporate relevant (previously ignored) social costs into prevailing market prices.

On the other hand, the positive role of technological innovation should be recognized. Under the pressure of governmental regulatory actions, technical options for pollution abatement programs are likely to expand quickly in the private sector. Once society acknowledges the need to pay for using the environment's capacity to absorb wastes, profit-motivated managers and engineers will give increasing attention to developing pollution control technologies as an integral part of plant design. In fact, medium and long-term costs may not rise at all for some products to the extent that environmental management provides incentives for efficient operations.

A more politically volatile issue, however, will be encountered when the burden of pollution control policies falls heavily on a particular industry and/or locality. This may be the case when a plant is forced to cutback or shutdown because of regulatory actions and few employment alternatives are available to the local labor force. When demonstrable hardships can be linked to pollution control policies, some form of government assistance will have to be forthcoming in order to minimize the impact on the affected population.

Also, rising production costs (and prices) resulting from pollution abatement expenditures on *some* products may have an impact on international trade patterns. If one country has environmental standards which increase the price of their export products, then the terms of trade will favor foreign competitors who do not face comparable pollution control regulations or who receive subsidies from their governments. To the degree national competitive positions in select industries are affected by environmental policies, trading partners will have to negotiate equitable readjustments in trade policy.

Methods for Determining Optimum Environmental Policy Goals

In final analysis, rational environmental policy goals will require use of the conceptual framework embodied in socioeconomic benefit/cost calculations. Though not without problems when so much of the quantitative information input is dependent upon subjective judgments, this approach will facilitate balanced decision making. Several steps must precede policy formulation:

- A survey of the character, magnitude, and sources of environmental deterioration;

- An evaluation of the social costs resulting from high-pollution activities of both public and private enterprises;

- An exploration of the alternatives available for ameliorating the environmental damage (e.g., required modification of technology, research needs, etc.);

- An estimation of socioeconomic "tradeoff" costs (including price increases and unemployment, etc.) for taking measures designed to enhance environmental quality--particularly difficult areas owing to problems of *social cost* determination; and

- A balanced examination of the relevant benefits and costs involved in a particular course of action.

As noted above, there will be conflicts with general economic policy. Efforts to "internalize external costs" will have significant repercussions within an economy. Take, for example, the automobile and its impact on the environment, e.g., urban congestion, air pollution, parking lots, highways, junk cars, etc. If total costs were fully internalized, auto prices and operating expenses would rise--especially for those with high polluting engines. This would encourage research in alternative modes of transportation and/or influence driving patterns of vehicle owners. The auto industry and the multitude of supportive industries would face inevitable economic "dislocations." Various forms of governmental assistance would be required to facilitate the transition to productive activities which are ecologically more acceptable to the electorate. This, of course, assumes that "the public" wants a re-allocation of resources and reflects this desire in the political arena.

The central economic issue is to allocate resources in a manner that will reduce undesirable trends in environmental deterioration. This objective should be achieved with minimal governmental infringements (via regulations) on private life. The most efficient mechanism for achieving this goal will be to provide the public with goods and services which are priced, insofar as possible, to reflect their true costs of production. In essence, people will then be required to pay for their ecological misbehavior. The complex issue of evaluating trade-offs between environmental enhancement and business as usual consumption patterns will be illuminated.

In seeking the lowest socioeconomic cost solution to environmental quality problems, it must be stressed that existing patterns of production and consumption will undergo select change. For some high pollution industries, new control measures will put severe strain on *marginal* firms and plants. If they cannot survive the rigors of the marketplace after society (via environmental management actions) has imposed *reasonable* pollution control measures, then they may be forced out of business. In effect, this would indicate that their contribution to national output must be less than the social costs of their particular economic activity. Under no circumstances should they be sustained by open-ended subsidization.

On this score, it must be remembered that a dynamic capitalistic system is characterized by change and supported by a competitive super-structure which can be a rigorous taskmaster despite the understandable efforts of most participants to secure monopoly status.

Ways for Achieving Environmental Goals

It is generally acknowledged that effective pollution abatement actions will require varying degrees of governmental involvement. This responsibility will require, among other things, general policy development, research sponsorship, standard setting, monitoring, and compliance enforcement. While the federal government will have a major leadership role to play in environmental goal determination and coordination of effort, the governmental unit closest to the problem situation should contribute to establishing and implementing remedial actions to the maximum degree possible. It is at the local level where the policy impact, both positive and negative, is felt and must be accommodated if goals are to be realized.

Priorities should be established which reflect both the urgency of the pollution problem and a consideration of the likely lowest socio-economic cost solution in terms of possible economic "dislocations." In this connection, it is clear that when there is sufficient time for essential background research, experimentation, and testing, the resulting technological innovations and corrective actions are much more likely to be successful. The various complex aspects of the environmental management must be considered and treated in a time frame consistent with the seriousness of the situation.

Meaningful transition periods must be a part of any requirement for extensive modification of industrial activities in response to environmental policies. Depending upon the nature of a problem, plant processes can be modified to incorporate recycling of waste materials or use of low polluting capital goods. These alternative methods, however, require reasonable lead times for implementation. On the other hand, imminent hazards may necessitate outright prohibition of specific pollutant discharges. More typically, effluents will be taxed or simply regulated to fit prescribed standards. A more detailed discussion of policy alternatives in this area is beyond the scope of this paper.

In summary, candid comment--given present technology--should acknowledge that environmental improvement will probably require both *short-term* sacrifices in consumption via higher prices for some products and localized distress. There will be some *temporary* conflicts with certain economic policies relating to the balance of payments and the employment issue. These problems, however, are subordinate to the overriding issue of establishing beneficial long term resource allocation patterns. Clearly, a "least-cost principle" for enhancing environmental quality will cause some socioeconomic dislocations which will require both transitional periods and external assistance for meaningful policy implementation. Also, as noted above, government assistance in the form of grants, loans, tax

credits, etc., will be necessary in order to cushion the necessary adjustments in exceptional situations. This aid, however, should be temporary in nature and have reasonable time limits explicitly established for making required adjustments.

Role of Environmental Education

The thrust of the argument outlined here is that public policies must be developed for achieving least-cost solutions to pollution problems. This will require remedial action consistent with technical progress whereby the *social* as well as other costs of environmental deterioration will be paid by the producer-consumer sectors which are responsible for creating the problem.

In final analysis, the crucial imperative for achieving environmental protection and/or enhancement turns on the issue of *public education* which stresses the need for realizing that "trade-off" decisions must be made which *balance* environmental *and* economic considerations. The public must realize that a "cleaner environment" will not be achieved without cost in terms of higher prices for certain products, short-run unemployment problems in select industries, and alterations in traditional production-consumption patterns. It is here that the teacher can move beyond the simplistic nature walk approach to environmental concern and extend the student's awareness to include the full picture. There is a need to elaborate constructive explanations of why an undesirable situation exists and what costs are required for corrective action.

In addition to learning that to some degree everyone is a polluter, the teacher can play a leading role in the development of an "environmental ethic." This enlightened way of doing things will place a premium on the need to husband available resources by avoiding waste and thoughtless ecologically damaging actions. Yet, environmental trusteeship does not imply that economic activity could or should be stopped. It is clear, however, that some destructive habits of the past will have to be modified in order to reduce their long-term consequences.

All activity requires decisions of choice among alternative ends. The central issue essentially revolves around how individual values are expressed collectively by a society's political system and how much we are willing to pay for a particular goal. A price must be paid for changing the *status quo*. The key question in this case is how much society is willing to pay for improved environmental resources. Indeed, if spontaneous economic growth is permitted and encouraged, it is likely that eventually finite natural resources and other environmental assets will be degraded or exhausted. On the other hand, an *understanding of both* socioeconomic and ecological processes will permit a society to plan adjustments in production and consumption patterns which will *maximize total welfare*. This is the priority goal that pragmatic environmentalists should seek. The task is complex in scope and elusive in substance. Nevertheless, visible progress is being made on many fronts.

Thought Questions on Economics

1. What can be done to insure that the student will have a basic understanding of the interdependence nature of all action relating to environmental enhancement, i.e., "everything depends on everything"?

2. The key issue is to have the public clearly understand that environmental enhancement is not achieved without cost--e.g., higher prices, changing consumption-production patterns, select employment problems, etc. Elaborate.

3. The society must decide in the political arena what sort of "mix" between conventional production and environmental quality is preferable. Comment.

4. What is the proper role for government in the area of environmental enhancement?

5. Explain what is meant by the argument that there are no more "free" goods? Do you agree?

6. Who should pay for pollution abatement programs? Do you agree with the "polluter pays principle"?

7. How would you define an acceptable "environmental ethic"? How can it be integrated into classroom activities?

Bibliography

Editors of *Fortune*. *The Environment: A National Mission for the Seventies*. New York: Perennial Library, 1970.

Council on Environmental Quality. *Environmental Quality*, Second Annual Report. Washington, D.C.: The Council, 1971.

Organization for Economic Cooperation and Development. *Problems of Environmental Economics*. Paris: The Organization, 1972.

PREPARING TEACHERS FOR ENVIRONMENTAL EDUCATION

By
George T. O'Hearn
University of Wisconsin-Green Bay

The mission of environmental education is cogently put forth in "The Tradegy of the Commons" by Garrett Hardin (1968). The commons which we share and use for our nourishment, recreation, and garbage dump has a limited carrying capacity. As we increase the number of people and as we increase use factors, we strain the capacity of the commons to support life. Hardin points out that

> The rational man finds that his share of the cost of the waste he discharges into the commons is less than the cost of purifying the waste before releasing them. Since this is true for everyone, we are locked into a system of "fouling our own nests" so long as we behave only as independent, rational, free enterprisers [p. 1243].

This is the crux of the problem and is the reason for increased emphasis on environmental education. The question is, "How do we develop viable programs of environmental education, and what steps do we need to take in preparing teachers to carry on programs of environmental education?"

The major objective of environmental education is to develop a working level of environmental literacy among all students based on a strong comprehension of ecological concepts with appropriate positive attitudes, values, and beliefs (O'Hearn, 1972). It is clear that environmental literacy cannot be achieved by a separate course or courses on ecological concepts but must permeate every aspect of the curriculum so that the student is immersed in it just as he is necessarily immersed in his environment (Cook, 1970). The problem goes far beyond simply developing appropriate cognitive constructs. It involves affective learning as well as the cognitive in a rich blend tied to the real world in which we live.

The charge has been correctly made that environmental education is difficult to define since it seems to include just about everything. That this is true is fairly obvious if you consider the word, "ecology," derived from the Greek "ekos" literally meaning "house" so ecology becomes the study of the house or the place where we live. Very little can be excluded from such a study. We must address ourselves to such questions as, How do we implement environmental education programs? How can the existing school structure and teachers accommodate such concerns? Can the transformation of the American school be gradual or must it be revolutionary?

Environmental Education: A National Priority

Environmental education has been identified as one of the priority areas for the U.S. Office of Education (USOE) by the Commissioner of Education, Dr. Sidney P. Marland, Jr. The concern for environmental education shared by our Congress is expressed in Public Law 91-516 which defined environmental education as the "educational process dealing with man's relationship with his natural and man-made surroundings, including the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning to the total human environment." Consideration of this congressional directive brings one to the conclusion that environmental education is the concern of each and every segment of our society not just the professional educator.

If this line of reasoning is followed, then we must conclude that transforming the American school and its curriculum to accommodate environmental concerns is a responsibility which the usual academic departments in our universities share with our professional schools of education as well as industry, the communication bloc, and governmental agencies.

The University of Wisconsin-Green Bay

One of the most comprehensive programs in environmental education in the nation is to be found at the University of Wisconsin-Green Bay where the entire curriculum of the university is devoted to the problems of man in his own environment. *Harper's* magazine editor John Fischer (1971) refers to it as a "Survival University," which brings students into contact with their learning experience and allows them to formulate the parameters of their own education. Fischer has written that "Survival U is alive and burgeoning in Green Bay, Wisconsin." At the University of Wisconsin-Green Bay, the entire academic plan focuses on man and his environment. The basic structure of the academic plan at the University includes a college of environmental sciences wherein students and faculty examine problems of man's bio-physical environment; a college of human biology where problems of man's adaptations to the environment and his growth, development, and nutrition are studied; a college of community sciences in which problems of the region and urban environment are considered; a college of creative communications which examines problems of man's values and his asthetic environment; and a school of professional studies in which students combine work on an environment problem with a professional application such as Business Administration, Leisure Science, Social Services, and Teacher Education.

The University considers the question of preparing teachers for a role in environmental education to be similar to the question of preparing engineers, doctors, or salesmen for the role in society with appropriate environmental awareness, sensitivity, and responsibility. This basis is a liberal arts curriculum rich in emphasis on environmental problems which leads to a new environmental ethic. It is the shaping of this environmental ethic which is the premiere goal in environmental education. The

ethic calls for a careful assessment of policies and practices and an appropriate tradeoff of costs to bring about the desired environmental balance. It calls for a transformation of lifestyles, an awareness of our interdependence with the bio-physical and socio-cultural environment.

The development of an instructional program to accomodate these applied principles and the environmental ethic can be best carried off in the framework of the existing school structure. Time is too short to consider any other route. At the University of Wisconsin-Green Bay, numerous pan-discipline courses have been developed which examine various crucial environmental problems and procedures. The development of such innovative courses is uncommonly expensive and difficult; it was made possible because the University was starting from ground zero with its academic plan, not replacing existing courses. Courses have been developed, such as Productivity of the Ecosystem; Systems Simulation, A Study of Alternative Methods of Operating Environmental Systems; Urban Technological Design; Community Air Pollution; Development, Technology, and Environmental Quality; Ethos, Ecos, and Ethics of Modernization; Human Living Space. In addition, professional education courses have been developed for the teacher preparation program which emphasize various aspects of environmental education. These include Introduction to Environmental Education in the Schools; Analysis of Learning Environments; and Developing Environmental Education Materials for the Schools.

In public schools, the development of such courses may not be practical or even feasible. But it is practical and feasible to permeate every elementary school and high school course with environmental awareness at a substantive level.

Environmental Education Strategies

Several significant strategies have been developed at the University of Wisconsin-Green Bay which lend themselves to adaptation within schools and which provide a framework for developing curricula and policies on teacher preparation and retraining. These strategies have been employed in the development of the academic plan at the University of Wisconsin-Green Bay and have been tested for four years on more than 4,000 students.

Problem-Centered Learning

It has become abundantly clear that students immersed in the ivory tower structure of the classical disciplines have significant difficulty in applying classroom-based concepts to the real world. Problem-oriented learning provides experience in applying knowledge to a particular problem drawn from a place where we live--our environment. It provides experence in using the power of developing knowledge in arriving at a better understanding of, if not a solution to, the problem.

The first requisite of a problem is that a conflict exists for an individual. In other words, what may be a problem for you or for me may not be of interest or be relevant to a student. The nature of a problem depends upon where the student is. Biological problems of ample dimensions exist in the rural areas of northern Wisconsin as well as the inner core areas of Chicago, Philadelphia, or Los Angeles. This suggests that each and every teacher apply knowledge that is being developed in his classroom to situations which are available first hand for his students.

Unfortunately, in the academic community there is a quiet rejection of applied problems, especially local, community-based problems, as being something less than pure. Keeping the discipline free of social entanglements protects the research discipline but does very little for society and for the instruction of school students or student teachers.

Environmental education calls for a rejection of this point of view of the introduction of observable problems into all aspects of the curriculum. In a science or social studies class, the problem method provides ample opportunity for contact with the real world--the environment outside the school. Problems of monitoring air quality require interdisciplinary cooperation of teachers of chemistry, physics, biology, and social studies. Real world data can be handled in school-level mathematics classes and made the example through which mathematical processes and concepts are learned. If we expect teachers to develop this type of problem orientation in their own classrooms, then we must provide them with the opportunity to develop this kind of expertise in college courses or in special in-service programs. Prospective or preserivce teachers, as well as in-service teachers, must be given the opportunity to take part in the analysis of environmental problems. Data and procedures developed by the Department of Commerce, the Environmental Protection Agency (EPA), state environmental agencies, and local groups should become available to schools for instructional use. First-hand experiences by teachers in monitoring environmental problems and in environmental policy and decision making seems crucial.

Perhaps the most neglected area in the study of environmental problems is associated with legal constraints. How many school teachers have actually been involved in the law-making process? These are real world problems that must find their way into the curriculum. Schools of education and curriculum leaders can take the initiative by giving their approval to such procedures and by providing exemplary materials for use in the various school areas.

Future-Oriented Learning

Environmental education must be oriented toward man's future. Unfortunately, at present much of our school curriculum is a study of what has taken place in the past in science, in social studies, and in the other disciplines. But that is past, and our students are living in the present and rushing toward the future. It is simplistic to

assume that the implications of the past for the present--or the future--are obvious. Neither implications nor applications will be seen or understood unless given the light of future orientation by the teacher. Environmental education recognized that change is a major characteristic of contemporary society, and the "Sabertooth Curriculum" can no longer suffice in such a classroom. This means that no day should go by in a classroom without projecting the future role of the students via the content that is being considered. It can be argued that such projections are fraught with the danger of error. This is obviously true, but the error of not making projections is far more serious than the problem of making a few errors in projections. As a matter of fact, the processes of predicting and decision making are a crucial part of the learning process in any educational program.

Future orientation means that a history teacher should examine what is being taught about the past in the light of implications that this holds for the student and his future. It means that the biologist should examine the role of DNA, not only from the point of view of the structure of discipline and of the scientific processes which produced the concept, but also from the point of view of the implications for man, and society, and the quality of life--one year, five years, and ten years from now. And it means the questions of values need to be raised about whether we in fact want to go down the road toward that particular future. It is a question of alternative futures and the assignment of priorities. It is a question of recognizing that we cannot preserve the environment as it is, but that we need to make decisions on which aspects of the environment we choose to preserve because we currently believe they are important, and what this preservation will cost in terms of dollars and other tradeoffs.

Environmental educators recognize that man has a hand in shaping his future and that teachers have a hand in helping students to develop strategies and means for ast least in part determining their own future.

Future orientation means that schools of education need to examine the role of societal change and strategies by which students and teachers-elementary and high school--can examine what is, what should be, and the means by which we get there.

Community-Involved Learning

Environmental educators recognize that the student is a citizen of the community, a citizen of the world, and his education must provide a means for him to relate to that world given the background knowledge provided by the disciplines and the analytical tools for understanding the world and himself in relationship to that world.

For the great majority of students, their lifestyle will involve work as a participant in environmental activities and a consumer of environmental resources but not as an environmental specialist. This suggests that the person preparing to be a physics teacher must be able to examine scientific principles from the point of view of their relationship to man *in* society. The question of social relevance, the question of social value, and social responsibility of man the scientist and man the consumer of science becomes a concern of the teacher. English teachers, teachers of biology, of chemistry, of middle school, and of elementary school require this new social responsibility which emphasizes the role of the student as an interdependent part of the total environment and the society of man.

Environmental education also requires individuals from the community, urban leaders, representatives of municipalities and industries be brought into the schools in an instructional capacity, not to supplant teachers but to supplement what is going on in the classroom. Environmental education assumes that students can get out into the community and can take a critical look at what is happening. It is an honest approach to a changing society. However, such a procedure requires that prospective teachers develop strategies for the wise utilization of these alternative instructional resources and resource persons. It means examining the procedures by which the classroom teacher can tap the resources of the community and can with administrative approbation make use of community personnel. It perhaps requires a change in the structure of some of the teacher preparation courses, and it also requires a new awareness on the part of school and college administrators.

Student-Initiated Learning

If we expect students to take the initiative in producing new information and to make rational decisions after they leave school, then such experience must be provided and expertise developed within the school program. Environmental education requires that the students have a major role in initiating their own conditions for learning, in selecting the problems on which they will focus, in discussing with the teacher the orientation and biases of the material under consideration, and in examining the social interaction of the knowledge and problems under consideration.

Provision should be made in teacher preparation programs for students to experience the development and initiation of their own learning experiences. Without this type of learning experience it would be most difficult for future teachers to foster this kind of intellectual responsibility on the part of the students that they are expected to teach. This suggests that rigidly fixed curricula in schools of education and in the academic departments need to be opened. It suggests that degree requirements and certification requirements may need to be made more flexible in order to accommodate the kinds of learning experiences which will be devised by students unencumbered by the constraints of sometimes archaic requirements.

Pan-Discipline-Based Education

At present, high school and college curricula alike are most frequently organized in terms of the disciplines of chemistry, biology, English, mathematics, etc. While it is true that these divisions of human knowledge and activity have been of great convenience to the producers of such knowledge (the university academicians), it is not necessarily true that these are the divisions most appropriate to learning and most relevant to the needs of society.

If we admit that environmental education is problem focused and is future oriented, then the knowledge, the concepts, and the processes of the various disciplines must be integrated and applied to a given problem. It is crucial for the student to see that a problem, such as a polluted stream, must be approached from the point of view of several disciplines and that each approach will produce different and not readily compatible answers. Each analysis, e.g., scientific, sociological, political, or economic, produces information and constraints which must be taken into consideration as necessary but not sufficient bases for decision making.

In most instances, nowhere in the school curriculum do students find the opportunity to do a multi-disciplinary analysis of a single problem and to bring into confrontation the divergent results of these analyses. Environmental education presupposes the existence of such pan-disciplinary approaches to learning situations, and it assumes full involvement of teachers with students. It is based on the reality that students will be confronted with such inconsistencies of information in decision making outside the schools.

A combination of pan-discipline learning with problem orientation described above opens up new vistas for environmental awareness. It must be carefully emphasized that the teacher has the responsibility to develop sufficient expertise in the related disciplines to be of assistance to the students. Similarly, the teacher in the preparation program must have the freedom to make use of experts in the associated areas which complement his or her own discipline training. Failure to develop this expertise or make use of the expertise of colleagues will result in the oft-cited superficial treatment of a problem, sometimes referred to as the pooling of ignorance, which guarantees the frustration of both the student and the teacher and the promulgation of misinformation. As programs of environmental education develop, criteria and levels of excellence must also develop. It is entirely likely that pan-discipline and interdisciplinary efforts, the combining of two or more areas of traditional expertise, will themselves yield to the development of new paradigms of learning, which in reality is the development of a new discipline. Students can share in the excitement of developing new knowledge and new ways of producing that knowledge.

Recommendations

In order to implement programs of environmental education, the primary need is a reorientation of the teacher toward man, his environmental problems, and the future. In general, additional summer school courses or academic year institutes organized along traditional lines will fail to be successful in developing environmental education awareness. Workshops or summer school courses, which may be conducted in part in a university, must be closely tied to the community, to the students, and to the society in which the teachers will function. Cooperative programs, run in part on a university campus and in part in the school system, may meet these needs.

Preservice programs should include a course or courses which introduce the student to the various strategies of environmental education (problem analysis, future orientation, etc.) as well as some of the basic concepts of environmental study (limited carrying capacity, interdependence, etc.). The level of conceptual-subject matter mastery depends on the certification area of the prospective teacher. It is unthinkable that a biology teacher could graduate from a college in the 1970's without a firm background in ecology and environmental science. But it is also crucial that the art teacher and the elementary school teacher have a working level of environmental literacy. This means that those responsible for advising students and for program and degree requirements should examine their procedures to incorporate new courses, new experiences, and new methods. And it suggests that state and national accreditating agencies and boards should examine their guidelines to incorporate the diversity of experiences and approaches appropriate to fostering environmental education.

Within universities and colleges there is need for more extensive communication between the academic departments and the school of education and with this integration an open acknowledgment that teacher preparation is a responsibility shared by all parts of the university. What is suggested in this paper for schools for education applies just as well to the discipline-centered departments.

Within local schools and within colleges and universities, support and leadership can be provided for student initiated learning. Curriculum units can be developed around case studies of environmental problems based on data from local agencies, air quality monitoring boards, or state natural resource agencies. Mini-courses can be built around local environmental issues, and teachers (both preservice and in-service) can learn by doing and learn from their students.

However, all of this requires administrative leadership or at least implied support. A facilitating administrative structure should allow changes and experimentation in the school curriculum toward the development of environmental education in all classes. Administrative policy and leadership should provide teachers and students with the opportunity to extend their learning outside the confines of the school, not necessarily through expensive transportation facilities but through adequate use of the school and its surround. The policy should enhance contact with the governmental,

industrial, and social structures of the community. Acknowledging the schools', students', and teachers' interest in and responsibility for the local environment (the local commons) is the first step to improvement of the regional and world commons.

On the national level, appropriate agencies should provide adequate support for teacher internships so that key instructional personnel can leave their own classroom for several weeks or a semester and take part in environmental education programs in other schools or universities or work directly in environmental monitoring programs. First hand experience with the real world has no substitute. Case study materials should be developed (and widely disseminated) based on national data such as are available from EPA. Local Environmental Impact statements and pending environmental legislation made available to teachers and students could help shift the time reference of the classroom from past to present to future.

Much of what needs to be done requires extensive use of the media, particularly the broadcast media of television and radio. Public broadcast time for airing environmental issues and well-developed instructional programs are essential.

Finally, research programs must be funded at colleges, universities, and public schools to identify needs, resources, and strategies. Without a proper investment in research and development programs, the environmental education movement can become wasteful and inefficient. It is far too important since our survival as a people--as a nation--is at stake.

Summary

The basic guidelines for environmental education include orientation of school programs toward the future; wider acceptance of problem-focused learning; concern in all areas of the curriculum for the human element--man in society; a pan discipline approach to learning and decision making; a school program that encourages student initiated learning; and acknowledgement that all education and especially environmental education is community oriented. In short, environmental education requires a "whole world" approach to learning--learning for survival.

Thought Questions and Basic Principles on Education

The environment exists as a commons from which we all derive our sustenance and on which we depend for our existence. The action of any individual or any group materially affects the quality of the commons and its ability to support life.

Question: What techniques can be used to bring teachers and students to understand the basic concept of interdependence and the associated concepts of limited resources and limited carrying capacity?

Environmental problems tend to be complex in nature and need the thoughtful analysis of the concerned citizen as well as the deep analysis of the policy maker-decision maker. The tools of analysis provided by the various disciplines which are studied in school will yield one type of information which may be essential to the solution of the problem. However, examining the problem from only one point of view will produce a one-sided solution. Comprehensive analysis from the points of view of several or all of the major disciplines is required. Such an interdisciplinary or pan-disciplinary analysis is essential and yet is not customarily provided for in the public schools.

Question: How can teachers and teacher preparation institutions change the existing curriculum to provide this type of pan-disciplinary learning both in education courses and in the academic departments.

Environmental problems which form the central theme of an environmental education program must be viewed with the broad perspective of time. The emphasis on the solution to environmental problems must be on the future. Yet most school education focuses on the past and what has been accomplished in the past.

Question: How can teacher preparation programs and the school curricula in general change the time focus to examine the probable implications of decisions made today for the immediate future as well as the future generations?

Environmental problems are problems concerning people as individuals and in society. The social structure which permits the development of major environmental crises is also responsible for the solution of these crises.

Question: How can the school structure be changed to encourage students to examine the social significance of various environmental actions and thereby place students in an active role within the society?

Question: How can teacher preparation policies be changed and school policies be changed so that representatives of the communities can be brought into the schools in an instructional capacity?

The minimum acceptable in environmental education might be called the awareness or sensitivity level in which the individual is cognizant of the environmental problem and aware that these problems exist and can affect him, his offspring, and the quality of life. At this minimum level, tools of analysis and understanding of the problems are lacking as are appropriate patterns for corrective action. A continuum exists from this minimal level of sensitivity to the full level of environmental action and policy making which would characterize a capable decision maker. This minimum level of environmental literacy is the least that we should accept and provision should be made for some students to achieve the higher levels of performance. This procedure requires student initiated learning in which the student identifies the problem and factors it into the appropriate components for his own understanding, sensitivity, and analysis.
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Question: How can student initiated learning be developed as an integral part of teacher preparation programs?

Question: What procedures should schools develop to accommodate such student-initiated learning with reference to environmental problems?

Question: What changes are necessary in school structure to permit responsible action on the part of students and teachers within the community?

Question: What guidelines should be established to identify the areas in which student-initiated activities are acceptable wiithin a school and/or community?

Bibliography

Cook, Robert, and George T. O'Hearn. "Processes for a Quality Environment-A Report of the National Conference on Environmental Education." Green Bay: University of Wisconsin-Green Bay, 1970.

Garrett, Hardin. "Tragedy of the Commons," Science; December 1968.

Fisher, John. "The Easy Chair: Survival University Is Alive and Burgeoning in Green Bay Wisconsin," Harpers; February 1971.

Marland, Sidney P. "Education That Cannot Wait," American Education, May 1970.

O'Hearn, George. "Environmental Education-The New Scientific Literacy," Journal of Secondary Schools Principals; January 1972

Part II

WHAT AND WHAT NEXT IN ENVIRONMENTAL EDUCATION

SOCIETY AND COMMUNICATIONS

By
Edward Stanley
Teacher Guides to TV, Inc.

The concept of the classroom beyond the classroom, the "classroom without walls" interests me. This means that the classroom is no longer shutting anyone out; take away the walls of the classroom, and everybody comes in-not just the teacher, then the kids, but the kids, teacher and society. Environment is not just natural forces, but also "social ecology" if you will accept this definition of social environment.

Social ecology includes housing in our metropolitan centers, where we don't manage to house ourselves decently. Social ecology involves transportation, which is inadequate in all cities. People who commute to the cities from their bedroom suburbs are taking a terrible beating--what this does to the human spirit I have no idea, but it cannot be good. It is utterly dreadful.

Anybody who has stepped into a New York taxi after having ridden in a taxi in London, for example, understands instantly what we mean by deterioration of the quality of life. A New York cab is dirty, the cars are broken, everything is bad about it; but this is all a reflection of the deterioration of our educational system. This system I take to be the basis, the fundamental rock of our society.

The concept of "the classroom without walls" signals a change in the educational environment, in the social ecology. We must somehow alter, change and improve the way we live with each other an the circumstances in which we live. Fine! But how are we going to go about this? We can do it only with people. Benjamin Bloom suggests that the way that you move and the way that you change the child is through the most important influence--the parent.

The parent can be reached quickest, perhaps best, by way of television. That is one reason why political campaigns run into so much money. Parents vote. But parents can be reached by way of television only when their attention to the tube is compelled; when their personal interests become entangled in the problem.

Very often we aren't dealing with the parent, but with the para-professionals in day-care centers. Don't knock day-care centers. Without them parents feel compelled to lock their children in one room until the working day for the mother is ended, and she has fought her way home on a jammed bus or a hot, packed subway. Or lock them out and into the street.

To use the paraprofessionals to reach the parent as well as the child means giving additional training to paraprofessionals, who much understand the dual nature of their new assignment, so they can reach the parents.

All of us can remember in some degree the influence that our parents and our family life had on us, and it would seem to me that this should

have been apparent to everybody long ago, if we want better people. It is insane to keep the ecological chain of social environment just the way it is--one welfare family generating another generation of welfare families. But these problems are not peculiar to Harlem--they are the same in Cherry Hills or in Westchester County as they are in Ocean Hill, Brownsville. And all have something in common with other ethnic groups; it surely must be our common humanity.

A comparison comes to mind: the revolution in agriculture caused by an idea generated in a man of 72 years, down in Texas. Seaman A. Knapp dreamed up the County Agent system, whereby dirt farmers were to be updated in farming methods by young men just out of Ag school, where they had special training as the link to the researcher in the laboratory. This turned out to be the unmatched, truly great success in mass education in our lifetimes. To succeed, the young man just out of Ag school had to convince the dirt farmer, who readily admitted that he wasn't farming "half as good as I know how to" that the new methods, the controls which Twentieth Century agronomy science put in his hands, and the results in cash money and in improved farms which were seen through a glass darkly, were worth giving a try.

The dirt farmers gave it a try, all right. The result is that we are physically embarrassed by the success of American agriculture.

With the paraprofessional who is already reaching the child in the day-care center, newly trained to reach the parent, in a role not dissimilar to that of County Agent, we make a serious effort in mass education.

The press has not done anything along this line. Educational pages in newspapers are used to report PTA meetings, to report school events and high school proms. This does not mean that educational pages could not be useful as educational tools, in teaching, not just reporting.

How do we make mass communication effective as a method of mass education? I'm not sure that can be done any more than that brave young teacher this morning can do what she had in mind doing. I don't see the social scientists involved yet; I don't see the psychologists; I don't see the social studies people. Maybe we don't have professionals as yet, who can and will direct their energies in this field.

We know that attitudes can be, and have been changed by mass communications--I have in mind the great music to which the American public was exposed by radio. Clearly the upsurge in symphony orchestras from Maine to California is one result of the upgrading in mass taste in music. I happened to be in Athens when the Minneapolis Symphony played a concert in the Amphitheater of Herod Atticus, under the baton of a Greek conductor - Dimitri Mitropoulos.

The Greek audience was in no way prepared for the superb performance of this outstanding orchestra. We know better, but to the Greeks, Minneapolis was somewhere out in the boondocks in the United States. They could not keep their seats when they heard this big American sound--you know the special way in which the major American orchestras can be distinguished by their continental resonance.

Well, if we can do it with corn and hogs, and great musci, surely we can do it with our greatest treasure, children.

ENVIRONMENTAL EDUCATION: A MOVE TO ACTION

By
Francis X. Sutman
Temple University

Today, as in the past, education in the schools and in teacher preparation programs places emphasis on facts and on the traditional disciplines such as chemistry, art and history. Some experimentation is occuring with so called interdisciplinary courses; yet, even these courses are too often highly structured dealing mostly in facts. At both the school and teacher education levels of education, the "so much must be covered" approach is emphasized as opposed to the "so much should be "uncovered" approach.

In schools and colleges where experimentation is occuring, it emphasizes new approaches to classroom organization and different ways of stating and defending what is to be taught. Note, for example, the many recent experiments with the open classroom form of organization and the emphasis on behavioral objectives and performance based education. In some instances different approaches to classroom organization have been confused with interdisciplinary education. This is unfortunate for interdisciplinary education has an important role to play in its own right, especially as it relates to education about the human environment.

Some proponents of the more recent educational innovations tell us that each of these will solve all of our educational ills. This is an example of the bandwagoning so common in education in the United States. It is clear that the problems related to environmental education will not be resolved through bandwagoning.

In environmental education, literally tons of material are available; almost all of which is designed to develop environmental awareness only. Very little material is action oriented. In this respect, educators have been spinning their wheels. It is essential now that something be done to cause a quantum jump to occur from awareness to action! For environmental education to be effective, school children, and even more so teachers in training, must be confronted with materials that will place them in problem-oriented situations where they can gain experiences in making both individual and group decision.

The need for including environmental education experiences in both the school curriculum and in teacher education programs is clear. Recommendations to this effect appear again and again. Note, for example, the recommendations of the AACTE publication *What Kind of Environment Will Our Children Have?* and the United States report to the United Nations Conference on the Human Environment. (See Appendix B.)

Some funded and nonfunded activity in environmental education related to teacher education is occurring at present. Yet, the state of the art is not entirely clear. To determine where we stand with respect to this kind of activity, a study similar to that reported in *Environmental Education: Academias Response* may soon be under way. The Academia Response publication describes about 25 action programs in

existence on college campuses. This report is laudable; however, teacher education cannot, and should not, wait for the results of a comparable study of on-going environmental education activity. The profession must move to action now!

If both the approach and the content is to be different in the environmental education, component of teacher education, the more traditional disciplines must give way to new disciplines, and teaching methodology must undergo change. New disciplines will emerge through the natural evolution of ideas and facts. However, methodology can change only with concerted efforts to replace the simple repetition of facts, to learning through involvement in more problem-oriented experiences. Only when both the present system of classifying content and approaches to teaching methodology change will a truly inter-disciplinary program of environmental education emerge.

Besides exposure to content and methodology, it is clear that both pre- and in-service teachers must deal with the professional questions related to the place of environmental education activities in their teaching. How does a teacher restructure the curriculum to allow time for environmental education activities in his teaching? What are the purposes for involving his students in a particular environmental activity: These are the kinds of questions teachers must have experience in asking and answering. Several sample activities coupled with questions to be dealt with by in-service teachers appear as Appendix A. More activities of this type should be encouraged.

Another useful way of examining the role of environmental education in programs for teachers is to realize that most teacher education programs today are not oriented to produce humane teachers. Visits to school rooms across the country will support this assumption. Environmental education experiences in which pre-and in-service teachers deal with the real problems of societal sociological ecology--if you will--can serve as a humanizing influence. The learning of facts must be balanced with other kinds of educational experiences, such as pursuing intellectual problems, being confronted with pragmatic concerns, and dealing with open ended issues, to ensure production of well-rounded humane teachers able to work with youngsters in all areas of environmental studies.

Today, we have the opportunity to stand back and examine what the commitment of teacher education ought to be to environmental education. We as teacher educators must pause in order to gain perspective and to infuse the educational system with the right energy-catalyst combination to make possible the quantum jump from awareness to action. A new publication, *Ekistics - A Guide for Conservation and Environmental Studies Curriculum Development*[1] can serve, along with this Conference, as that catalyst. Teacher education programs must include ample opportunity for problem solving and decision making. Problem solving encourages a broader examination of mans' role in his environment. Let us show our concern through the development and utilization of action oriented materials in environmental education.

1. See *Environmental Education*, Vol. 3, No. 4, 1972, "Ekistics - A Preview"

THE CONCERNS OF EDUCATION FOR HUMAN ECOLOGY

By
Roger Bauer
University of Wisconsin-Stevens Point

The focus of major efforts in teaching ecology *must* be the student. We must consider:

°How do we prepare our students to survive in a world that we seem to be trying to make uninhabitable?

°How do we prepare our students to accept the responsibility of stewardship for our total resources which must become the concern of all citizens?

°How do we develop leadership abilities in those students who have a strong potential to lead?

°How do we help our students to re-order their thinking, now based on their heritage of values which emphasizes personal acquisition and gain at the expense of our resources, to a new way of considering the good of all first and personal gain second?

Unless education can resolve these problems, this spaceship we call Earth is in serious trouble. We must help our students to fully utilize the resources of our physical-biological environment for the good of all Earth's inhabitants in order to assure our continued existence. We must concentrate on developing future adults capable of making long-range choices using rational thinking based on the best possible data available at any given time. We must prepare these individuals to make the best of possible choices at those times when the economy-ecology crunch occurs.

The implications for teacher education are tremendous and could, if not checked, boggle the mind so thoroughly as to make effective results impossible. Just the thought of re-educating hundreds of thousands of teachers already in service, while trying to educate equally large numbers in pre-service can be very frightening. Or, it can be a tremendous challenge. And this is what it must be.

When we think of educating teachers to teach children, most of our thoughts and efforts have been directed toward the cognitive domain, the facts of knowledge. This has never been the complete answer and certainly will not serve to prepare enlightened teachers who can stimulate students. Knowing the facts about our ecology, or our economy, with no basis of translating the facts into actions based on values, is practically no answer at all to our dilemma.

It should be obvious to all of us that we must train, and retrain, teachers to become effective in helping children to learn and to develop in all three domains--the cognitive, the affective, and the psycho-motor. Perhaps the most difficult endeavor for us is to help teachers to see that none of these domains ever stands alone. We cannot stress one without placing emphasis on the other!

There is no question that we must help children to learn the facts within the cognitive domain. But, more important, we must help them to use the facts learned and the data collected in translating what they have learned into viable programs for the good of all.

This obviously leads us directly into the affective domain and the values we all have inherited from those who have gone before us. It is here that teachers in service and most teachers in preservice will have a major problem with their own values. Most of us have been brought up to expect that the rights of the individual are paramount in nearly every situation and have had this expectation supported time and again by the courts. This attitude must change so that we begin to value the good of all persons first and the good of the individual second.

In effect, we must educate for attitudinal and value changes away from the "American Dream" to a "Dream for America," and the world.

Certain persons will probably argue that we have already begun to develop a swing toward the goal described above. And to a point, this is true. We are not, however, moving fast enough. Time will not stand and wait so that we can tool up to do the job. While we procrastinate, our economy, hopefully, moves forward and the drain as well as the strain on our ecology continues.

One of the most difficult areas in attempting to instill a new set of values through the educational process is the need to redefine our present values; to accept new ways of thinking based on rational thinking, rather than emotional responses to specific situations.

The example that comes to mind immediately is the production of electric power. Emotional environmentalists and persons seriously concerned about our ecology have used every possible means to prevent the use of nuclear power plants and large coal-burning plants in isolated parts of the country to produce the power our appliances demand. (At the same time, however, these same people continue to accept the production of more electrical appliances and growth of industry which uses large amounts of power. We cannot have both.) If our ecology must be preserved at all costs, then we as citizens must be prepared to bear those costs. And all of us must re-order our values before we will be ready to make the sacrifices, personal and financial, that will need to be made.

This is not enough. Even if we have helped children learn factual knowledge and have helped them to learn to re-order their values, not much will happen until we have helped our students to learn to develop in the psycho-motor domain. We must learn to act, to do things, to get ideas translated into actions, to make things go for the good of all.

We know several methods by which we can accomplish this in teaching, but the best of all is to teach by example. Our students will have to be able to see others doing things, living what they say, before they, too

will begin to follow. An excellent example of this being done successfully is the procedure used in Mexico to help their people to learn to read. The entire project, which was most successful, can be summed up in four words: Each one, teach one! Not exciting, not expensive, not must of anything except, it worked.

How do we do all this? Where do we select the content material to be taught? How do we decide what materials will do the best job? All are good questions, but sometimes hard to answer--not this time.

The content to be taught? Simple--a working knowledge of all that touches us as individuals. We can never learn it all, but we can continue to learn and nothing is more interesting to any of us than that which directly affects us in some way. Just consider for ten seconds the questions you can raise about the ecology of a pencil--from its beginnings as raw material to why a particular pencil got into your pocket instead of mine. I do not know all the answers and neither do you. But, suppose we did? How smart we would be! This is the kind of content that our search for understanding of our ecology must make us accept as pertinent to the learning of children.

The material to be used to teach? Just as simple as the content. It is all around us. All we need do is to look, it is there. Now, study and learn all about it; those few words describe a lifetime of activity.

The major laboratory to accomplish this? Simple again, everything around us but especially things outside the classroom. Schools without walls must become a fact of all learning rather than a description of a rare event called "field trip."

I have made things sound overly simple. We still must ask the question: How do we get people to change enough to do these things? Again, the answer is simple; carrying out the simple answer is difficult. I have jotted down four methods of inducing change that should work. You certainly will be able to think of more.

1. People must become involved in doing, in getting their hands dirty, in proudly pushing out their chests and saying, "I took part in this." Some of this may need to be mandatory at first, but it can be done.

2. Set legal restraints which require adherence to change. Our anti-litter law on public highways is a good example.

3. Economic restraints on those who do not comply with desired change. This is something like taking the bad tasting pill because we know it will make us better. Zoning laws seem to be one example of how this can be made to work.

4. In a broader sense, we must educate for change and one way to do this is to change ourselves.

We have come full circle now. We started with ourselves, encompassed everybody and everything, and now find that none of this will work unless we start within ourselves. This may seem to be a slow and inefficient means to begin, but remember "Life is hard by the yard, but a cinch by the inch."

Basic Principles of Ecology

1. Teacher education students, and future students of these students, learn best through involvement in activities that allow them to experience first hand the problems they are seeking to solve.

2. Students, who will be our future citizens, must be helped to learn how to make rational decisions, based on the best possible data available, and to accept the results of their decisions.

3. Teachers must be helped in learning the procedure of helping their students to develop an "Environmental Ethic."

4. Teachers must be helped to recognize and utilize the resources available in the community in which they teach. This must include human, physical, and biological resources.

Part III

MAJOR PRINCIPLES AND CONCEPTS: AN EPILOGUE

THE ENVIRONMENTAL CRISIS AND EDUCATION: AN EPILOGUE

By
Joel L. Burdin
ERIC Clearinghouse on Teacher Education

The novice in environmental science, technology, and education is flooded by printed matter on environmental problems and education, some produced by persons who have been involved for years in professional endeavors, others less seasoned. The array of materials can easily create frustration and uncertainty as to what actions are defensible, desirable, and feasible. This can lead to indecisive and unproductive or to emotional and haphazard reactions to our environmental crises. A blending of strong concerns, intelligent public responses, and competent professional input is needed. At stake is public policy based on a creative synthesis of lay-scientific-technologcial objectives, insights, and competence.

Interacting with select professionals during the writing conference, I was impressed with significant uncertainties about where we are now and where we should go next--both in the society and in education. Also, there are many doubts concerning how to attain societal objectives--once our values and ethics are clarified and implemented to an operating degree--and supporting educational objectives and actions.

There is considerable consensus that scientific capabilities are available to protect and enhance our environment, to whatever level that is accepted as "desirable" by the people, at whatever level of activity they are "willing to pay" for environmental enhancement. Societal values, ambiguities, and conflicts are reflected in the schools--particularly public schools. The school must incorporate the science and technology of environmental education as well as its politics, economics, sociology, and ethics!

In a time of general consensus educators could create and implement a curriculum with considerable ease and security. Now the complexity, magnitude, and speed of change of environmental factors--and public interest in the environment--puts the educator in a hot spot indeed. That they are in such a position is a compliment to the increased role of education in our contemporary world. It is a position of importance long yearned for by many!

What the teacher's response should be in efforts to create a better environment is an important question. Some would have teachers become activists in local actions--a sort of Pied Piper leading young and old citizens into action for a cleaner, better world. Others would have the teacher be involved as an individual citizen, but somewhat detached and scholarly in work with elementary-secondary students. In the latter role the teacher would help create a higher quality environment by means of helping K-12 students (a) develop

supportive values and objectives and (b) learn to think rationally, reasonably, and effectively as citizens of a democracy. There is continuing debate on this. My belief is that "a" and "b" are the teacher's role as a professional. Hopefully as an enlightened and competent individual citizen, each teacher will actively join with others in a creative, dynamic relationship to solve problems and attain a higher quality, more humane society and world.

National Values, Objectives, and Strategies

While educational personnel rightly take some specific environmental actions, eventually it will be society at large which must assume the lead in improving the quality of the human life. This requires a reordering of American values, to move away from emphasis upon personal gain to what's good-for-the-most. Ultimately, we must willingly sacrifice as individuals, if necessary, to create a quality environment. A quality environmental ethic is essential.

This could lead business and the general population to initiate direct action and accept social and economic consequences. This could include realistic pricing to include the costs for solving environmental problems, a step beyond present costing which includes production of goods and services. Political and economic clout must be provided to create a higher quality environment. This necessitates a major change in priorities, in which human resources would assume the highest order of importance. Environmental issues are so complex that one wonders--apprehensively--about the validity of the B.F. Skinner claim in *Beyond Freedom and Dignity* (N.Y.: Knopf, 1971)--that individual freedom may need to be seriously curtailed or conditioned in order to provide for survival of humanity. What the developing environmental ethic will be is not clear.

There is some tendency among Americans to get excited about emerging issues and make some faddish efforts to solve problems. The damage to the environment has been building for decades; it will not be undone in a few weeks or a few months. We need to build a sustained commitment to environmental improvement which can undergird our study of issues and of alternatives, then move to serious implementation over the long haul. Stagnation of efforts can result if environmental action creates an institute or a building or a committee--each of which would give the impression of having solved one more vexing problem. Simplistic, "the-way" approach to solving complex problems will not work. Rather, there needs to be continuing multidisciplinary, whole-society efforts.

Broad environmental perspectives require that we think not only about what is good for personal health but also what is essential for the nation's social and economic well being. The net effects of certain actions should be considered in a broad context; for example, closing a local polluting plant may solve some human health problems immediately but create disastrous economic conditions. After careful analysis, it may be necessary to close such a plant, but it then may be imperative to subsidize the local community's economic welfare.

Rational approaches may be replaced by emotional approaches, such as a group's blocking a power plant expansion--while at the same time catering to personal comfort by buying more air conditioners and other electrical appliances. A crusade may lead people to strong efforts to assure conditions for "happy fish," but there may be serious economic consequences if blanket bans on pollutants in the waters are adopted before technology is utilized to permit the continuation of economically feasible operations. Another emotion-laden issue is zero population growth--which is a critical societal option but which to some means interfering with personal freedom.

Our society must replace emotionalism *but not feeling* while learning how to move continously and expertly toward solving major social problems before they emerge. This is better than letting them build to crisis proportions. We have skills to monitor environmental conditions. We have the science and the technology to do something about them before crises occur. But if problems do get out of hand, it is important that we not move too rapidly before we see the total consequences of our actions.

The American ethic about "doing something" in a hurry can solve one problem and create another one--or many others. In current and appropriate concerns about the quality of the environment, it is possible that we may create unforeseen problems. Certainly, action is needed to improve the quality of the environment, but we need to capitalize upon our capabilities to study and act in the context of complex factors which endanger our environment. Modern computer capabilities are basic in simulating multiple options and alternatives and in decision making in which all variables can be related, consequences of alternatives simulated, and best choices selected.

Certain public policies are needed for realistic response to contemporary society's complexities. We should creatively blend bans and penalties for undesirable environmental practices and incentives for sound practices. We need to use penalties selectively along with incentives. Blanket bans and blanket incentives do not reflect the complexities of environmental problems. The full impact of incentives *and* bans should be weighed before action is taken. Certainly the general public must be aware of the cost of such an approach, for the public pays for a quality environment, just as it pays heavily for an inferior environment.

America's multiple levels of government have to be examined to determine how they contribute to the creation of environmental problems and to their solution. The concept of creative federalism and regionalism should be incorporated into public policy.

The curriculum for K-12 pre- and in-service teachers should include all social sciences which help the teacher to be active participants in local environmental action programs. Students should be taught to capitalize upon the political, social, and economic resources wherever they are found--on the national, regional, state, and local levels. It is quite possible that there now exists adequate laws and processes for

dealing with environmental problems: For example, one person has called for specifying that all waters are "navigable" when passable by canoe--if this is the only way to get action on cleaning up Americas waterways.

The intelligent use of science is a continuing and vital tool in raising the quality of human environment. There have been two contradictory and naive tendencies: (a) to put science on a pedestal as an infallible source of all wisdom and truth, (b) to criticize science for its alledged contribution to the deterioration of the human environment. Science, like technology, is value free. It is the public that determines how science is used or abused, to help or hinder humanity. The public has the right to demand that science's assets be applied to solving social problems--while at the same time protecting pure scientific research and development which benefits all over the long run.

Utilizing the mass media more often and more effectively is important. As an educational tool it is an important way to cut the time lag between problem generation and problem solving. Schools, as they now formally exist, are too slow. They are only one way to educate. While the use of the mass media for entertainment will continue, the American people should find a way to capitalize on the effectiveness and cross-society impact of print and broadcast media. Technology of mass communication educates all the people continuously. The mass media reach the total society regularly and in sustained ways. Educators need to be people who can create learning within the total society and utilize all educative resources. Schools, as buildings, should be viewed only as a small part of a total educational resource.

Major problems such as the environment should be studied and acted on in the context of other complex social problems. One example of our current and economic problems with environmental impact is pilferage in the stores. One business response to minimize this is to create large packages which cannot be as easily "lifted" as small ones. This is wasteful economically, and it generates an abundance of waste paper and plastic which contributes to the general polluting of our environment. This is but one example of how environmental action has to occur in the large context.

Some Specific Educational Approaches

Several specific educational responses seem to be appropriate to improve environmental quality. A reading of the earlier papers in this report produces certain generalizations. The following strategies for improving the environment through better education are explicated or intimated in several of this publication's papers, as well as in many other places. Credit is not provided to specific individuals, but I express appreciation for the input of many people.

Clearly, past overemphasis of educators on the cognitive domain has broadened to include all of the "domains" of educational knowledge. Particularly, the affective domain--how people believe, feel, and perceive--is of great importance if Americans are to develop the will to secure an improved human environment. Mere cognitive awareness of the existence of environmental problems and what the facts are does not lead people to take action--particularly to the point of sacrifice--to improve the environment. Of course, intellectual awareness of environmental problems and of their solutions is important. The overworked but relevant expression pertinent to intellectual awareness is "necessary but not sufficient."

To secure better environmental education requires the development of "problem-focused education" concurrently with more humanistic programs. The nucleus of the curriculum should be the problems of humanity. The academic disciplines should be used to benefit humanity rather than to create academicians. The use of "real world" problems of a local city or region can create much interest in the learning process and in the substance taught by the schools. The danger of this position is that in its extreme projection it could become anti-intellectual. In trying to make education more meaningful, it is possible for learning to become devoid of depth and breadth--shallow and parochial. Of course education should be a pragmatic synthesis of all the "domains" of education and not bound to local situations.

To improve education is to focus less on what to cover and more on what to uncover: personal values, attitudes, experiences, syntheses and interpretation, confidence, and commitment. Meaningful education deals with content and processes which can be related to the immediate as well as long-term needs of the learner as he perceives them. The process leads from the concrete to the abstract, from the specific to the general.

Education which starts in the environmental backyard of the learner can branch out to broader vistas, to learnings not boxed in by distance or by time. It would be possible then, to go from a concern with and action about local environmental problems to a concern for and commitment to improve the environment for all mankind!

There is a question of how to bring in all disciplines to accomplish this and whether environmental education should be (a) a separate discipline, (b) a fusion of several disciplines, or (c) a building and broadening of capabilities of academicians from distinct fields. In any case, it is necessary to help professionals communicate and cooperate in solving broad problems such as environmental ones. Determination must be made on which disciplines can make a contribution to environmental improvement and education and on how to capitalize upon their knowledge, processes, and insights.

Then, too, some say that professionals who have been traditionally excluded from the environmental field can provide useful commitment and capabilities in environmental action. There is a basic disagreement as to whether or not professionals acting as concerned citizens outside their field of expertise can be very *effective*. Can, for example, a

nuclear physicist intelligently deal with marine pollution? Can a marine biologist contribute to efforts to clean up the air? If yes, in what manner and to what extent? Educators have to determine the sources of content and strategies for environmental education. They must be selective in their utilization of diverse professionals and laymen in curriculum building and teaching-learning processes.

A number of less philosophical points can be generally accepted:

1. There is value in getting hands "dirty" in environmental action; this creates a sense of personal involvement which leads to commitment to do more. It is desirable to go from personal exposure to and involvement in specific environmental problems to rational study of various environmental disciplines. Simply stated, it is a hand to heart to head to heart to hand progression.

2. Local school teams of teachers can be utilized to teach the broad range of facts and processes needed to improve the environment, for example, geography and biology. Teachers of art and literature--and others--can find ways of imparting knowledge, attitues, and skills necessary for a systematic and sustained drive toward quality human environment! If teaching teams are to be effectively used in the K-12 school setting, clearly it is necessary for preservice and in-service preparation programs to provide the knowledge and the practice necessary for interdisciplinary efforts. Collegiate programs themselves should demonstrate the interdisciplinary approach to problem solving.

3. Using student interests and activities can add a significant force for improvement. One person has suggested that student-produced libraries of projects on local conditions could be effective for continued use. Students could involve citizens in projects outside formal school sites. Student-initiated learnings should go beyond "spoon feeding." There is too much of a tendency to assume that student-initiated learnings can be postponed almost indefinitely.

4. Creating a corps of educational change administrators on all levels could lead to future improvements. Administrators are the key to determining the atmosphere for educational change and for making it work.

5. Joint professional efforts to clarify the teacher role in preserving the society vis-a-vis building a new social order is an imperative. We are back to the question that George S. Counts raised in the 30's: *Dare the Schools Build a New Social Order? (American Education,* "Men, Institutions, and Ideas Series,"1969. Reprint of 1932 edition.) As long as local boards of education ultimately determine the curriculum and the means of implementing it, this determination has to take place on the local level. Teachers who think beyond

formal school settings can play an important part in clarifying student and public understanding of the varied and dynamic roles for education. Working within the educational and social system, teachers can be valuable interpreters of educational potentialities and practices which could improve the environment and help solve other significant problems.

6. Futurism, particularly educational forecasting, is an important tool in preparing educational personnel for emerging conditions. (Burdin, Joel L. *Futurism: A Needed Step in School Personnel Preparation.* East Lansing: Michigan State University, 1970.) As O'Hearn stated in his paper, we need to avoid "walking backwards" to our own graves. The community, the professional educator, and students should develop a conception of how education can preserve the best of the past--adapted by rational and sensible consensus--to create the intellectual and ideological tools for working towards change. While school personnel may not themselves be change agents, they are essential agents in change processes.

7. Educators must make sure that accreditation and certification processes are tools to facilitate creative change and problem-solving. If the parity concept emerges--providing for involvement of all affected persons on equality basis in solving professional and teaching-learning problems--as the accepted mode of governing the education profession, educational personnel must make sure that accreditation and certification processes reflect the best peer judgment as to what needs to be done relative to environmental and other pressing social problems. This requires moving away from course counting and covering.

Clearcut strategies are needed to attain specified objectives. Environmental education is of such importance that it must be planned to the ultimate degree. It cannot be left to the whims of a particular day.

From Facts Mastery to Learner Growth: The Educator's Role

Ultimately the teacher must know something about the substantive aspects of the environmental crisis. While he needs to "feel right" in his heart about the crisis, have good interpersonal skills to help students develop sensitivities about needed quality for human environment, and have excellent organizational skills to put the curriculum together in a meaningful way, he must also have a sound intellectual grounding in environmental data. It is important for the teacher to both have a substantive background on the environment and also the sources of information and ideas to which students can be directed. If improving the quality of the human environment is indeed to assume a major priority in our society, it is logical to assume that mastery of a certain amount of content is needed by the teacher. Illustrative of the questions that teachers must be able to answer are

1. How has technology improved the quality of human life?

2. How has technology impaired and polluted human life?

3. What are our technological capabilities for improving the quality of human environment to a socially determined level ?

4. What are the barriers to effective use of our existing and emerging technology in improving the environment?

5. What socially accepted strategies and priorities in the effective use of technology are there, and what needs to be done to move toward implementation?

6. What are the key environmental principles, concepts, and questions for students?

7. How can the total school curriculum be organized to lead students of all ages, as well as citizens, to an understanding of the key facts and ideas as well as effective ways to bring about action?

8. What are the resources available to teachers and students as well as citizens: print, media, people, and places?

The teacher, then, is the key person for "putting it all together." He knows the facts. He knows how people learn effectively. He knows the sources of learning materials of all kinds that can help the student move forward in his own idiosyncratic, personalized way to alter his behavior in positive ways, both individually and socially. The teacher--to illustrate the meaning of professional--has knowledge, attitudes, and competencies which neither the student or the adult layman can legitimately be expected to know. This professional educator's role is an exciting and demanding one indeed. It transcends the stereotype of the teacher as automaton: sitting behind a desk, passively dispensing facts without adaptation to student response or lack of it, coldly delineating the questions which each student must answer regardless of his capabilities or interests or his personally disturbing concerns of a particular day, lecturing on the total realm of human knowledge as if this were *the* stuff to be memorized, objectively testing the degree to which each student can regurgitate fact and formula, and marking each on the basis of assessment--regardlesss of capability or effort. Of course, this is a dreadful picture--a grotesque stereotype. To the extent that such teachers exist, the teaching-learning processes are mutilitated. Topics such as creating a quality environment for human beings should move the teacher away from any semblence of this stereotype. Quality human environment is of sufficient relevance and interest to help the teacher to join together with students, with other professionals, with the general public and help our suffering earth and its inhabitants! Environmental education for quality human living can add a rich dimension to the curriculum and help the teacher move into the very lifestream of the larger society. This is the kind

of task that can revitalize in-service teachers, can help to create more meaningful preservice education, and can add an exciting dimension to the work of all involved in the teaching-learning process.

While the ecologist, the technologist, the economist, the scientist, the politician, and a host of others provide knowledge, technology, and social processes, educational personnel are key people in helping children, youth, and adults learn the facts, the processes, and the skills essential for improving the environment. Bringing together social objectives, substantive knowledge, and teaching-learning processes is the primary and unique work of the educator. No other personnel have this very special task.

Broad Principles for Preparing Educational Personnel and for Organizing Their Educational Sites*

Today's educator is under press to "do something" about widely recognized environmental crises. As an active citizen he can provide leadership in broad approaches to move the nation forward. However, it is in his competence in helping children and youth gain meaningful attitudes, knowledge, and skills that the educator makes his most significant contribution. The defense of man lies in the teaching-learning processes. This role goes far beyond crisis reactions and beyond faddish steps.

The following broad principles are provided to put together the big picture in preparing educational personnel and in organizing them for productive activity. The principles are somewhat loosely related, but there is a general flow of ideas from broad topics to specific ones, from societal factors to professional ones. While the principles are generally applicable to all of education, illustrative notes are provided on their application to environmental education.

Preparation programs for education personnel must become multicultural and international to help school personnel become pioneers in developing the kind of world which recognizes problems and aspirations of all humanity. The fact that the poor and disadvantaged, both at home and around the world, pay the greatest price for poor environmental conditions should be a source of major concern, translated into a commitment to improvement.

Educational personnel should learn to utilize educational forecasting--projecting present conditions and capabilities into what the world is likely

*Adapted from Joel L. Burdin, "ERIC News" (ERIC Clearinghouse on Teacher Education), May 1971 (Vol.3, No.4) and September 1971 (Vol.3, No.6).

to become--in moving toward better utilization of the man-made and natural resources and tooling up for an idealized-yet-possible world for all people. Educational personnel need a broad perspective of that possible world to keep their activities in a true perspective and to avoid faddish, emotional, short-term activities which dissipate resources and energies for big goals.

Trainers of educational personnel who can contribute to a better world must become *more meaning and quality-oriented.* They need to prepare school personnel who will be key people in societal efforts to secure:

°Quality rather than quantity;

°Person-values rather than thing-values;

°Understanding and personal meaning rather than mere knowledge acquisition;

°Group identity, effectiveness, and productivity rather than blatant individualism;

°Development and wise use of human-manufactured-natural resources rather than mere technical and organizational efficiency--in short, the good life for all rather than mere extensions of life-spans and material affluence.

Effective educational preparation programs must become personalized to develop humane, sensitive school personnel who can counterbalance the depersonalization of complex, cybernetic living. They need a sensitivity to human aspirations, potentialities, and problems--a key to continuous effort to establish relevance for children and youth. Just *how* to develop humane, sensitive school personnel is open to question. Certainly, it requires more than cognitive accretion of fact upon fact, and it requires more than the development of technical competence in the act of teaching. Pre- and in-service educational personnel require direct experiences with all kinds of human beings, as well as with the unique sensitivities and perspectives of the artists, the writers, and the philosophers. Educational personnel need to know themselves--all their aspirations, potentialities, and complexities--and then move from this point of self-awareness to a desire to help other human beings to find themselves. Such educational personnel will be able to join in the efforts of other people to counterbalance current depersonalized human existence.

While it is important that extensive and comprehensive efforts be undertaken to adequately carry out pre- and in-service preparation programs, it is likewise imperative that efforts be made to attract the right kinds of people into the education professions. The development of children and youths' aspirations for educational careers is a starting point. Up until the very point of selecting educational careers, the prospective professionals should be provided with facts, with counseling, and with sensitivity-inducing activities to help them be sure that their career selection is based upon the desire to serve other people competently and humanely. Throughout the pre- and in-service period, educational personnel

must be "counseled out" if it appears that their performance as professionals and as human beings is inadequate for the fantastically big task at hand. Careful efforts are needed to get each teacher into that particular position wherein he can serve most effectively. An important part of all these efforts is to create in the minds of students, professionals, and laymen an understanding of education as a dynamic means for solving major societal problems such as the environmental crises. A broad public dedication to education and a determination to support it ultimately are very effective stimuli to the selective recruitment of future teachers, beginning at the elementary-secondary level with promising prospects.

Increasingly, educational personnel must have an important voice in determining what the profession is to be like. Obviously, professionals have a key stake in the selective admissions and retention processes and in "counseling out" educational personnel where needed during their pre- and in-service life.

Educational personnel also need to assist in the development of plans for precise staffing patterns for each particular school to be tailored to the needs of a particular student body and community. This kind of involvement will increase the odds that the local staff can rightly be held accountable for results.

Total, active professional efforts to influence diverse agencies, organizations, and enterprises--and a general citizenry--in creating the climate and the conditions for effective environmental ventures are necessary in community action efforts. Only when the conditions for exercising professional leadership are positive can educators stimulate and facilitate the total growth of all learners. The complexity of this task demands preparation programs of exceptional effectiveness.

While the preparation of educational personnel--the initial and lifelong training--must be strongly interdisciplinary, education must become a stronger discipline in its own right to enable it to develop school personnel who are among the nation's best educated persons. They should be capable of (a) relating various disciplines to teaching, living, and learning and (b) helping children and youth know and practice the processes of the various disciplines. Particularly in something like the environmental crisis, it is absolutely necessary to have the input and the systematic way of studying and solving problems as practiced by the various academic fields.

Sound education necessitates preparing educational personnel who can be theoretical and clinical to create conditions wherein theory and practice interact to enrich each other. The former is particularly significant in environmental education, which has often been strong on feeling and weak on theory and hard knowledge. Theory is important in providing adequate conceptualization of the teaching-learning processes. Practice is needed to provide the testing, revision, and interpretation of theory.

School personnel preparation must become highly systematized. It should require specified performance levels relative to knowledge, skills, processes, and attitudes. It needs a systems approach to provide rational decision-making, processes, monitoring and assessment, and incorporation of needed changes.

When a social crisis has reached a public emotional level--as our environmental problems have--there should be counterbalancing by the professional judgment and skills in helping the young to work toward the time that the complex crisis can be alleviated. While we have highlighted the need for humane and sensitive educational personnel, we must equally stress that in our increasingly complex and rapidly changing world, more than a warm heart and open hand are essential.

In moves toward making education more relevant, the training of educational personnel must become more spatially dispersed and diversified in objectives, methods, kinds of personnel utilized, instructional resources, and ways of assessing individual performance. The objective is to create permeable membranes around the formal school setting and reject tendencies to wall the school off from its community physically and psychologically. School personnel must become social, behavioral, and communications practitioners competent in using the *total learning environment* and its resources: persons, things, places, knowledge, and ideas. Preparation programs should help school personnel experience diverse teaching-learning processes and practice their own personalized productive styles and processes. The programs should be monitored and adapted on the basis of professional, peer, and personal feedback. Self and other input should help personnel become professionally mature and secure. This, in turn, can give educational personnel courage to experiment, to adapt, and to grow while encouraging children and youth to do likewise. It is ridiculous to wall off the school from the real world--which is each person's prime teacher--and nowhere is this truer than in environmental education.

Curriculum decisions about topics such as environmental education should involve the educational personnel who work directly with the children. Curriculum organization, materials development and selection, and instructional leadership and practice are responsibilities of the total staff. Extensive participation in forming organizational patterns, from local to national levels, can stimulate and facilitate sound curriculum development and improvement. Selection of instructional materials from a wide range of existing options and the conceptualization and creation of new materials for particular learners are imperative. Self-accountability and curriculum improvement follow. Educational personnel and elementary-secondary students, along with the general citizenry, can develop curriculum materials and practices which begin to make a difference in the world about us.

The immediacy of environmental problems creates a motivation for learning and behavioral change of great efficacy. Environmental education can well become one of the organizing foci for teaching and learning. Environmental action centers can facilitate the blending of theory and practice.

The concept of a portal school--a special place in a school district where pre- and in-service teachers can learn to "put it all together"--is extremely appropriate in environmental education. Teachers can go out of such places back to their regular teaching sites and there help their colleagues experiment and grow.

Responsibility for helping to organize pre- and in-service preparation programs--in the local school system, in collaborative centers, and under collegiate auspices--can make the total profession accountable for producing sound in-service objectives and implementing them in the schools. Barriers between teachers, administrators, and college personnel should be lowered to permit free exchange of ideas, information, and skills between all personnel.

Health, transportation, and other domestic services serve educational purposes. School staff should serve on school and community groups responsible for making such services supportive of curriculum. This can broaden their understanding of the community and open new places for children to secure educational experiences. Environmental education is of such importance and vitality that clearly educational personnel must make sure that the total community is the classroom.

Research is an important counterbalance to emotional responses in societal crises such as the environmental one. Research skills should enable educational personnel to work effectively with laymen, students, and other professionals to make sure that environmental education is based on sound data. Continuous objective assessment and interpretation of the environmental program should be carried on by students and educators. The efforts of the schools must be grounded both on what is known and believed about environmental education. Objective data can secure community support for present programs.

Conclusions

Past tendencies to convert the curriculum into a body of knowledge to be memorized and regurgitated must be eliminated. Knowledge becomes wisdom only when it is internalized in ways meaningful to an individual. In the case of environmental education, it is effective only when each individual working as part of a democratic society moves toward the improvement of quality of the human environment. The successful task could be immensely rewarding; failure would have terrifying consequences. There is no sensible alternative other than to use environmental education as one of the basic tools in the efforts of the total society to move beyond the present degradation of the environment.

Our goal is a quality environment which enables each person to attain the good life!

DIRECTORY AND BIBLIOGRAPHY

Compiled by
Patricia Sparks and Francis X. Sutman
Temple University

DIRECTORY OF SOURCE MATERIALS

American Association for the Advancement of Science
1515 Massachusetts Avenue, N.W.
Washington, D.C. 20005

American Association of University Women
2410 Virginia Avenue, N.W.
Washington, D.C. 20006

American Chemical Society
1155 16th Street, N.W.
Washington, D.C. 20036

American Forestry Association
919 17th Street, N.W.
Washington, D.C. 20006

American Geological Institute
2201 M Street, N.W.
Washington, D.C. 20037

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Washington, D.C. 20036

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Washington, D.C. 20036

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Washington, D.C. 20036

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Washington, D.C. 20036

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2000 N Street, N.W.
Washington, D.C. 20036

Educational Relations Section
Soil Conservation Service
Department of Agriculture
Washington, D.C. 20250

Educational Resources Information Center (ERIC)
Clearinghouse on Teacher Education
One Dupont Circle, N.W.
Suite 616
Washington, D.C. 20036

Educational Resources Information Center (ERIC)
Clearinghouse on Science, Mathematics, &
Environmental Education
1460 West Lane Avenue
Columbus, Ohio 43221

Educational Services Department
National Audubon Society
1130 Fifth Avenue
New York, New York 10028

Environmental Protection Agency
Clean Water
Attention Publications Office
Washington, D.C. 20460

Environmental Resources, Inc.
2000 P Street, N.W.
Washington, D.C. 20036

Izaak Walton League of America
1326 Waukegan Road
Glenview, Illinois 60025

Minnesota Environmental Education Steering Committee
350 Centennial Office Building
St. Paul, Minnesota 55155

National Association of Conservation Districts
1025 Vermont Avenue, N.W.
Washington, D.C. 20005

Publications Unit
National Air Pollution Control Administration
5600 Fishers Lane
Rockville, Maryland 20852

Sierra Club
220 Bush Street
San Francisco, California 94104

Wilderness Society
729 15th Street, N.W.
Washington, D.C. 20005

BIBLIOGRAPHY

References on Ecology

Farb, Peter. Ecology. New York: Life Nature Library, Time-Life Books, 1970.

Ecological topics are treated and many illustrations, including color photographs, reproduced. Clear and sufficiently non-technical, the source is suited for junior high school students or upper level elementary students.

Kormondy, Edward J. Concepts of Ecology. Englewood Cliffs, N.J.: Prentice Hall, 1969.

This basic text is understandable to the student who has had little or no prior background in biology or chemistry.

National Academy of Sciences. Resources and Man. San Francisco: W. H. Freeman, 1969.

Eight essays on the human ecosystem; the nature of resources; human population; food, mineral, and energy resources are presented.

Odum, Eugene P. Ecology. New York: Holt, Rinehart and Winston, 1963.

The classic ecology text is presented here in condensed version.

Scientific American. The Biosphere. San Francisco: W. H. Freeman, 1970.

This series of 11 articles presents an overview of the cycles of matter and energy involved in the maintenance of life on Earth. Additional articles deal with human food, energy, and materials production as processes in the biosphere.

References on Technology

Newell, Reginald E. "The Global Circulation of Atmospheric Pollutants," Scientific American, 244:32-42; 1971.

How atmospheric pollutants travel and what affects they might have on the world climate is discussed.

Odum, Howard T. Environment, Power and Society. New York: John Wiley and Sons, 1971.

The use of inanimate energy as a fundamental factor in the success and failure of modern civilization is discussed.

Scientific American. Energy and Power. San Francisco: W. H. Freeman, 1971.

These articles are taken from the September 1971 issue of Scientific American which was devoted to the sources, uses, and effects of human energy production.

Snow, C. P. The Two Cultures: And a Second Look. New York: Cambridge University Press, 1964.

Snow suggests that the division between the "scientific" and "humanistic" worlds may become unbridgeable.

References on Economics

Council on Environmental Quality. Environmental Quality, First Annual Report. Washington, D.C.: the Council, 1970.

Council on Environmental Quality. Environmental Quality, Second Annual Report. Washington, D.C.: the Council, 1971.

Council on Environmental Quality. Environmental Quality, Third Annual Report. Washington, D.C.: the Council, 1972.

These Presidential Reports to the Congress are prepared in accordance with the National Environmental Policy Act. They summarize on-going federal activities and provide much useful information about environmental issues.

Daly, Herman E., ed. Essays Toward a Steady-State Economy. San Francisco: W. H. Freeman [in press].

Editors of Fortune. The Environment: A National Mission for the Seventies. New York: Perennial Library, 1970.

The chapters in this book originally appeared in the October 1969 and February 1970 issues of Fortune magazine.

Jerrett, Henry, ed. Environmental Quality in a Growing Economy. Baltimore, Md.: Johns Hopkins Press, 1966.

This collection of provacative articles is written by leading scholars.

Organization for Economic Cooperation and Development. Problems of of Environmental Economics. Paris: the Organization, 1972.

This document is a compendium of technical papers given during a seminar conducted by the OECD Environment Directorate in June 1971.

General References on the Environment

Carson, Rachel. Silent Spring. New York: Fawcett, 1962.

This book brought the environmental crisis to public attention.

DeBell, Garrett, ed. The Environmental Handbook. New York: Ballantine Books, 1970.

An outgrowth of the first national Earth Day April 1970, this book includes a widely read collection of articles concerning the environmental crisis.

Disch, Robert, ed. The Ecological Conscience: Values for Survival. Englewood Cliffs, N.J.: Spectrum, 1970.

Essays about human attitudes toward nature are collected.

Dubos, Rene. So Human an Animal. New York: Charles Scribner's Sons, 1968.

Dr. Dubos considers humans to be equally products of environment and heredity. He discusses some of the dehumanizing effects of modern environments and suggests remedies.

Glass, Bentley. Science and Ethical Values. Chapel Hill: University of North Carolina Press [n.d.].

The content of the book is reflected by the quote "Finally, I have reversed the line of thought and tried to demonstrate that science itself is a subjective, social, human enterprise completely dependent upon its own ethical foundations. In these days when natural sciences are assuming so great a role in the development and alteration of our civilization, when every man must modify his ways of life decade by decade to accomodate himself to the changes wrought by scientific technology in human culture, for too little thought is given to the ethical basis of our science."

Guthrie, Daniel A. "Primative Man's Relationship to Nature," Bioscience, 21:721-23 [n.d.].

The author suggests that pre-agricultural peoples were not intentionally kinder to their environments than we are.

Hardin, Garrett. "The Tragedy of the Commons," Science, 162:1243-48; 1968.

This landmark paper has sparked tremendous discussion, numerous sequels in print, and at least one film. Hardin criticizes man's freedom to exploit the environment which may be summed up by the quote, "Ruin is the destination toward which all men rush, each pursuing his own interest in a society that believes in the freedom of the commons."

Moore, John A. Science for Society: A Bibliography, 2nd ed. Washington, D.C.: American Association for the Advancement of Science, 1971.

This annotated bibliography contains current references related to all areas of societal concerns.

Background References on Environmental Education

American Association of Colleges for Teacher Education. What Kind of Environment Will Our Children Have? Washington, D.C.: the Association, 1971.

This report of the western hemispheric conference on "Education and the Environment in the Americas" contains specific recommendations for programs in teacher education.

Commission on Undergraduate Education in the Biological Sciences (AIBS). Environmental Education: Academic Response. Washington, D.C.: the Commission, 1972.

Several academic programs in environmental education, completed in cooperation with the Conservation Foundation are described.

U.S. Department of State. U.S. National Report on the Human Environment. Washington, D.C.: the Department, 1972.

This report was prepared in response to a request by the United Nations in preparation for its Conference on the Human Environment.

The Universities and Environmental Quality Commitment to Problem Focused Education. Washington, D.C.: U.S. Government Printing Office, 1969.

Recommendations to the President's Environmental Quality Council on the role of environmental education in universities are given.

References on Educational Action*

Abrahamson, Dean E. Environmental Cost of Electric Power: A Scientist's Institute for Public Information Workbook. New York: Scientists' Institute for Public Information, 1970.
ED 040 063. EDRS Price: MF-$0.65; HC-$3.29.

The environmental and health hazards associated with different forms of power production are analyzed.

Cook, Robert S., and George T. O'Hearn. Processes for a Quality Environment. Green Bay: University of Wisconsin-Green Bay, 1971.

A collection of presentations made at the National Conference on Environmental Education at the University of Wisconsin-Green Bay December 1970 are presented.

Darnell, Rezneat M., and others. Education, Learning, and Communication, Ecology and the Undergraduate Curriculum, Session 1. Washington, D.C.: American Association for the Advancement of Science, 1969.
ED 046 689. Not available from EDRS.

These two audio cassette tapes contain four papers presented at the 1969 AAAS Meeting on Ecology and also contain the question and answers session which followed each.

Hafner, Everett M., and others. Education, Learning, and Communications, Undergraduate Studies in Environmental Science, Session 1. Washington, D.C.: American Association for the Advancement of Science, 1969.
ED 047 936. Not available from EDRS.

Four topics regarding education's role in the field of environmental science are presented on these two cassette tapes resulting from the 1969 AAAS conference on undergraduate environmental sciences.

Hafner, Everett M., and others. Education, Learning, and Communications, Undergraduate Studies in Environmental Science, Session 2. Washington, D.C.: American Association for the Advancement of Science, 1969.
ED 049 913. Not available from EDRS.

These two cassettes include proceedings of the 1969 AAAS conference and a student panel discussion of a wide range of environmental issues.

Hershey, John T., and others. A Curriculum Activities Guide to Water Pollution and Environmental Studies. Washington, D.C.: Environmental Protection Agency [n.d.].

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*See About ERIC (p. 84) and ERIC Ordering Information (p. 85).

An intensive water study made by the Filton School Water Pollution Program in Filton, New Hampshire, had as its major outgrowth a collection of water.

Landsberg, Hans H. "The Demonology of Pollution." Paper presented at Environmental Teach-In, April 1970, Pittsburgh.
ED 051 071 EDRS Price: MF-$0.65; HC-$3.29.

This paper offers a fresh perspective on causes of and solutions to environmental problems and would be useful as an initiator of classroom discussions.

Minneapolis Independent School District 275 [Environmental Education Units]. Minneapolis: the District, 1970.
ED 043 511. EDRS Price: MF-$0.65; HC-$3.29.

The use of games to introduce elementary school children to some concepts about environmental factors is described in this group of five documents.

Minneapolis Independent School District 275 [Environmental Education Units]. Soil Sampling. Stream Profiles. Free Watching. Plant Puzzles. Minneapolis: the District, 1970.
ED 042 638. EDRS Price: MF-$0.65; HC-$3.29.

Five of these eleven units describe methods elementary school students can use when studying soil characteristics.

Major, James M., and Charles A. Aissell. Environmental Education Objectives and Field Activities, 3rd ed. Paducah, Ky.: Paducah Independent School District, 1970.
ED 049 026. EDRS Price: MF-$0.65; HC-$3.29.

This two-part teachers' guide contains educational objectives and numerous field activity suggestions for environmental education.

Michigan State Department of Natural Resources. Environmental Education for Junior High Grades: A Teacher's Manual. Lansing: the Department, 1969.
ED 036 447. EDRS Price: MF-$0.65; HC-$3.29.

Teaching suggestions for environmental education are grouped under geology; water resources; soil and land use; trees, woodlots, and forests; and wildlife and fishes.

New York State Department of Education. Environmental Education Instructional Activities, K-6. Albany: the Department, 1970.
ED 045 436. EDRS Price: MF-$0.65; HC-$3.29.

As one of a series of two teacher's guides dealing with environmental education, this publication for grades K-6 contains basic concepts,

activities, and questions designed to emphasize the primary role of man as a participant in, rather than master of, his natural surroundings.

New York State Department of Education. Environmental Education Instructional Activities, 7-12. Albany: the Department, 1970.
ED 045 437. EDRS Price: MF-$0.65; HC-$3.29.

As one of a series of two teacher's guides dealing with environmental education, this publication for grades 7-12 contains basic concepts, activities, and questions designed to emphasize the primary role of man as a participant in, rather than master of, his natural surroundings.

Roth, Robert E., and David Archbald. Environmental Education Concepts and Teaching Activities. Portage, Wis.: Cooperative Educational Service Agency 12, 1970.
ED 045 356. Not available from EDRS.

This activity-oriented guide was developed for teachers of environmental education K-12.

Schatz, Albert and Vivian. Teaching Science with Garbage. Emmaus, Pa.: Rodale Press [n.d.].

An interdisciplinary approach to environmental education from the points of view of science, mathematics, and social studies is offered.

Schools Council. Curriculum Research and Development in Science. London: the Council, 1971.
ED 053 994. EDRS Price: MF-$0.65; HC-$3.29.

Summaries of the objectives and types of science materials produced or planned for K-12 children in English and Welsh schools are provided.

Sexton, Alan. George School Students and Ecoactivities. Newtown, Pa.: George School, 1971.

A creek study, with emphasis on activities, their procedures, and their results is done by secondary students.

Terry, Mark. Teaching for Survival: A Handbook for Environmental Education. N.Y.: Ballantine Books, 1971.

This introductory book deals with the issue of the environment from an educational view point.

University of Wisconsin-Green Bay. The University of Wisconsin-Green Bay. 1970-71. Green Bay: the University, 1969.
ED 035 378. EDRS Price: MF-$0.65; HC-$3.29.

This general catalogue describes the UWGB, a new and innovative institution whose special academic focus is on ecology.

U.S. Department of Interior, Federal Water Pollution Control Administration. A Primier on Waste Water Treatment. Washington, D.C.: the Administration, 1969.
ED 044 269. EDRS Price: MF-$0.65; HC-$3.29.

This informative pamphlet is for teachers, students, or the general public concerned with the types of waste water treatment systems, the need for further treatment, and advanced methods of treating wastes.

Viederman, Stephen. Developing Education Programs on Pollution Awareness. Washington, D.C.: American Association of Colleges for Teacher Education; Organization of American States, 1970.
ED 043 551. EDRS Price: MF-$0.65; HC-$3.29.

The goals of population education are discussed.

Wight, Edgar L., and others. Environmental Awareness: An Action Approach. Washington, D.C.: U.S. Department of Interior, Bureau of Indian Affairs, 1971.
ED 047 834. EDRS Price: MF-$0.65; HC-$3.29.

This booklet was designed to help teachers and students in learning of the relationships of the environment to the human race.

Wolozin, Harold. The Economics of Pollution: Economic Topic Series. New York: Joint Council on Economics Education, 1969.
ED 051 040. Not available from EDRS.

This trilogy examines economic relationships that help explain why pollution is a special problem of production and assumption, surveys the difficulties of measuring and assigning costs, and analyzes measures to combat pollution.

Appendix A
SAMPLE ACTIVITIES IN ENVIRONMENTAL EDUCATION FOR TEACHER EDUCATION

Following are four sample activities in environmental education originally designed for use with school-age children but revised for use with teacher education programs. Teachers in training complete the exact activities as they would have youngsters complete them, but in addition, they are asked to answer a set of questions designed to cause serious consideration of the implications of the environmental activity in their classrooms. These "profession-oriented" questions appear at the end of the sample activities; for they can be asked of any one of them. Note that these activities are student action oriented!

ENVIRONMENTAL ISSUE: DISPOSITION OF SOLID WASTES

In this activity, students consider the magnitude of the solid waste problem. Students examine their own waste disposal patterns and that of their family. In so doing, they learn how much solid waste they discard over a period of time and the nature of that waste. The activity is designed for students from grade four through college and may require from one day to one week to complete depending on how long data are collected.

Questions:

°To lead into the activity:

1. Do you have any idea how much solid waste is discarded in this country each day?

°To initiate activity:

2. How much trash and garbage (solid waste) do you throw away each day?

Activity: Determining the amount of solid waste discarded daily by a single individual--you.

Materials: Bathroom scale, paper, and pencil.

Procedure:

a. Over the period of one day, weigh all the trash and garbage discarded in your household. You may weigh the waste directly by placing it on the scale or you may weigh yourself and the waste together then deduct your weight.

b. Divide the total amount of waste weighed by the number of persons in your household. This will give you the average amount of trash and garbage discarded per person per day.

°To continue the activity:

3. Examine the waste discarded by your household. Can you break down the types of waste into categories?

4. What is the most common form of solid waste in your household?

Procedure:

c. Look at your results. Compare them with the rest of the class. Determine the average amount of solid waste discarded per day per person.

d. Using the figures from your class and the approximate national population of 200 million people, determine how much solid waste is discarded per day, per week, and per year for the entire country.

°To expand the activity:

5. Consider the vast amount of solid waste discarded each year.

6. What happens to this waste when it leaves your home?

7. Where does it all go?

8. What does the term final disposal mean?

9. What are some other sources of solid waste?

Bibliography

A Pledge and a Promise. Newark, N.J.: Anheuser-Busch , 1970.

Cleaning Our Environment: The Chemical Basis for Action. Washington, D.C.: American Chemical Society, 1969.

Johnson, Huey D., ed. *No Deposit-No Return: Man and His Environment; A View Toward Survival*. Reading, Mass.: Addison-Wesley, 1969.

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ENVIRONMENTAL ISSUE: THE TREATMENT OF SEWAGE*

In this activity, students learn about sewage and waste water treatment. The students learn how sewage is processed in their town and in neighboring communities. New laboratory techniques and equipment will be introduced which will enable students to determine the efficiency of various sewage treatment procedures and to appreciate, in a more precise way, the problems in an important but often neglected or unnoticed part of everyone's life. The time required for the activity may vary from two to four periods depending on the difficulty of selective procedure, student interest, and time and equipment available. The activity is designed for students from grade seven and up.

Questions:

°To lead into the activity:

1. What happens to the sewage and waste waters that leave your home?

°To initiate the activity:

2. What type (primary, secondary, or tertiary) waste water facilities does your community have? (Consult local authorities, i.e., local health department or sanitary engineer.)

3. Are all types of wastes (sewage, run-off) treated the same?

4. How effective is the treatment?

5. How could it be improved?

Activity: Learning how sewage is processed.

Materials: Sample bottles; microscope slides; microscope; dropper; a LaMotte, Hach, or Delta water analysis kit; and aquatic identification books for identifying micro-organisms.

Procedure:

a. Make a trip to your local sewage treatment plant. Ask the plant manager to give you a tour of the plant. Discuss with him the various steps in sewage treatment. What level of treatment is used?

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*Adapted from that found in *A Curriculum Activities Guide to Water Pollution and Environmental Studies*, by John T. Hershey, *et al.*, a publication funded by Grant No. ITTI-WP-4101, Training Grant Branch, Water Quality Office, Environmental Protection Agency.

b. Take samples at the final sewage tratement stage.

c. Determine the nitrate level in the water using the water analysis kit. What is the significance of this level?

d. Determine the pH of the water. Why is the pH important in processing sewage?

e. Examine your samples for clarity. Is the water clear or cloudy? How would you expect the water from tertiary treatment to appear?

f. Examine a sample microscopically. Identify organisms you find using the identification books.

°To continue the activity:

6. Are the methods of elimination of pollutants which you have encountered the most effective methods possible?

7. If not, why not?

8. What tests can be performed to determine the effectiveness of treatment plants?

°To expand the activity:

9. Consider the sewage treatment in your community and ask

a. Is the sewage treatment in your community adequate?

b. What factors could effect a change in the sewage load in your community?

c. To what extent does zoning in your community allow for residential and industrial expansion?

d. Would you want to drink the water coming from the final sewage treatment stage?

e. What factor would have to be considered in purifying this water for drinking?

(1) The technology required?

(2) The cost of processing?

(3) Paying for the processing?

(4) Advantages and disadvantages to you and the community?

(5) Ecological effects on life in the stream resulting from a change in effluent?

Bibliography

Cleaning Our Environment: The Chemical Basis for Action. Washington, D.C.: American Chemical Society, 1969, pp. 106-38.

Pelczar, Michael Reid. *Microbiology.* New York: McGraw Hill [n.d.], pp. 500-22.

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USING THE ENVIRONMENT: TRASH FOR ART

Discarded items can be combined to make interesting abstract art forms. Collect a variety of small discarded items. Some suggestions include yarns, caps, string, cans, oil, rubber bands, wood scraps, small motor parts, clock works, and so on.

Materials: Scrap items; glue or paste; and oak tag, posterboard, or pieces of wood.

Procedure:

1. Sort out your scrap pieces. Arrange them several ways to get ideas on how they should be put together.
2. Start in the middle of the oak tag and work outward pasting each piece in place.
3. Let the pieces dry well.

Outgrowth:

1. Does your finished art work tell a story?
2. Does it have a theme?
3. What common items are displayed?

* * * * * * * *

USING THE ENVIRONMENT: MAKING POT HOLDER RACKS

This useful kitchen accessory is made from common throw-aways: a cardboard tube, a scrap of printed cloth, some odd lengths of cord, and three small cup hooks. Many substitutes can be made on the basic design. For instance, paper can be used in place of cloth or the tube can be colored with crayons or paint.

Materials:

1. A single cardboard tube.
2. A scrap of colorful cloth about 7 inches by 15 inches. You may want to use matching cloth to make the potholders.
3. Any heavy cloth material such as an old, discarded blanket to use as a filler for the pot holders.
4. A strip of wood that is ½ inch shorter than the cardboard tube.
5. Three small cup hooks.
6. Thread and needle.
7. Paste or glue.
8. Cord or yarn.
9. Scissors.

Pot Holder Rack Procedure:

1. Cut a piece of printed cloth so that it will a little more than fit around the round of the cardboard. Leave two inches of material for each end.
2. Place glue on the tube.
3. Wrap the cloth around the tube and smooth all lumps and wrinkles.
4. Put some paste on the inside of the tube ends and fasten the cloth on the inside of the tube.
5. Cut the wood strip so it fits inside the tube. Its length should be ½ inch shorter than the tube.
6. Glue the wood to the inside of the tube. The hooks will be fastened onto the wood.
7. Mark off the positions for each hook.
8. Cut three lengths of cord or yarn and braid together.
9. Punch a hole at each end of the tube about one inch from the end. Thread the braided cord through the hole and knot the ends for inside the tube.
10. Cut two cardboard discs to fit exactly inside the tube ends. Cut two circular discs of cloth material that is larger than the cardboard disc. Place the cloth over the discs and paste to the back of each. Use them to plug the ends of the tube.

11. Screw three hooks into the marked positions on the tube.

Pot Holder Procedure:

1. Cut two 6-inch squares of cloth. (These will be the front and back of the holders.)
2. Cut a 5½-inch square of filler material.
3. Place the 6-inch cloth squares so the right sides face each other.
4. Place the filler on top and sew together on three sides.
5. Turn the holder inside out.
6. Cut a loop of material. Secure it inside one corner.
7. Fold the material ends inside and stitch togehter.
8. Stitch through the middle of the holder to secure the filler to the holder.

* * * * * * * * *

TEACHER ORIENTATION QUESTIONS

After completing the environmental education activity, answer the following questions as they relate to your own teaching situation and to your own personality as a teacher.

1. You have a set curriculum you have decided to complete during the school year. But now you decide to include one or more environmental education activities and to do so, you must eliminate something from the curriculum. What would you eliminate? Justify your decision.
2. List three objectives you feel you can meet by incorporating one, two, or three of the above environmental-oriented activities into your program.
3. List two modifications of the activity that will make it more useful for your class situation.
4. State one or two objectives of the modified version of the activity that is not met by the original activity.
5. Take one of the expansion questions from the activity and from this question develop an extension activity.
6. Consider the statement, "If you are not part of the solution, you are part of the problem." What are your responsibilities as a teacher relative to the environmental problem considered in this activity? What are the responsibilities of your school community relative to this problem?

Appendix B

UNITED NATIONS COMMITMENT TO ENVIRONMENTAL EDUCUATION*

Subject Area IV

Educational, Informational, Social, and Cultural Aspects: Also Conservation Conventions.

IV-111. Continuous Social Diagnosis. Recommends arrangements for continuous diagnosis to measure social and cultural impacts of environmental developments. This would include UN financial and technical assistance to governments for (a) preparing national reports on the environment; (b) developing social and cultural indicators for the environment with a view to a common methodology for assessing environmental quality in this area; and (c) organizing the exchange of information on methods for continuous social diagnosis.

The U.S. *supported* this recommendation. It will help foster needed data collection and assessment methods in the area of social monitoring. A great deal more study is required before meaningful international reports on socio-cultural environmental quality can be envisioned.

IV-114. Education. Recommends that the Secretary-General and the organizations of the UN system especially UNESCO, establish an international environmental education program. The program is to be interdisciplinary and experimental in approach and to be directed towards all levels of the education contiuum, including preschool, primary, secondary, and adult education.

The U.S. *supported* this recommendation.

This program would include technical and financial support for an inventory of existing systems of education which deal with environment; exchange of information on such systems; environmental training and retraining of teachers and other professionals; expert groups to exchange experience between countries with similar environmental conditions; new materials and methods for environmental education.

IV-115. Training. Recommends UNESCO, under the Man and Biosphere Program, WHO, FAO, UNIDO, WMO, the scientific unions, etc. should develop innovations in environmental training of specialists and technicians and foster environmental training at the regional and international levels.

The U.S. *supported* this recommendation.

*Excerpted from the Department of State's *Round-Up of Actions Taken: UN Conference on The Human Environment*, June 21, 1972.

IV-116. Volunteers. Recommends that international organizations for voluntary service and, in particular, the International Secretariat for Volunteer Service, in consultations with the United Nations Volunteer Program of UNDP, include environmental skills among the services they provide.

The U.S. *supported* this recommendation.

IV-119. Public Information. Recommends an information program to create public awareness on environmental issues and elicit contributions from non-governmental organizations; an annual "international environment day;" translation and circulation of Conference documents; integration of environmental information into public information work of the United Nations system; and cooperation on environmental information among United Nations regional economic commissions.

The U.S. *supported* this recommendation.

IV-120. Environmental Information in Development Programs. Recommends that certain international development programs be adapted to disseminate environmental information and strengthen community action on environmental problems.

The U.S. *supported* this recommendation.

IV-126. Duties of Secretary-General. A recommendation that the Secretary-General make arrangements to be kept informed of national pilot schemes for environmental management; assist countries, on request, with experiments and research; and organize international exchange of information adopted by consensus.

IV-137. Exchange of Information: Referral Service. Recommends Secretary-General to establish an international Referral Service for efficient international exchange of information on environmental problems and solutions.

This U.S.-introduced Recommendation was approved unanimously.

Hundreds of environmental information services and data are in operation but, except to relatively small user constituencies, are relatively unknown and unused. The Referral Service would be a modest and practical tool to tell what information services exist, where they are, and how to gain access to them. It would, in effect, place countries requesting information of all types in contact with appropriate information resources in support of local, national, or international environmental programs.

ABOUT AACTE

The American Association of Colleges for Teacher Education is an organization of more than 860 colleges and universities joined together in a common interest: more effective ways of preparing educational personnel for our changing society. It is national in scope, institutional in structure, and voluntary. It has served teacher education for 55 years in professional tasks which no single institution, agency, organization, or enterprise can accomplish alone.

AACTE's members are located in every state of the nation and in Puerto Rico, Guam, and the Virgin Islands. Collectively, they prepare more than 90 percent of the teaching force that enters American schools each year.

The Association maintains its headquarters in the National Center for Higher Education, in Washington, D.C.--the nation's capital, which also in recent years has become an educational capital. This location enables AACTE to work closely with many professional organizations and government agencies concerned with teachers and their preparation.

In AACTE headquarters, a stable professional staff is in continuous interaction with other educators and with officials who influence education, both in immediate actions and future thrusts. Educators have come to rely upon the AACTE headquarters office for information, ideas, and other assistance and, in turn, to share their aspirations and needs. Such interaction alerts the staff and officers to current and emerging needs of society and of education and makes AACTE the center for teacher education. The professional staff is regularly out in the field--nationally and internationally--serving educators and keeping abreast of the "real world." The headquarters office staff implements the Association's objectives and programs, keeping them vital and valid.

Through conferences, study committees, commissions, task forces, publications, and projects, AACTE conducts a program relevant to the current needs of those concerned with better preparation programs for educational personnel. Major programmatic thrusts are carried out by commissions on international education, multiculutral education, and accreditation standards. Other activities include government relations, use of Job Corps centers in teacher education, and consultative service.

A number of activities are carried on collaboratively. These include major fiscal support for and selection of higher education representatives on NCATE--an activity sanctioned by the National Commission on Accrediting and a joint enterprise of higher education institutions represented by AACTE, organizations of school board members, classroom teachers, state certification officers, and others.

The Association headquarters provides several secretariat services which help make teacher education more interdisciplinary and comprehensive: the Associated Organizations of Teacher Education,

International Council on Education for Teaching, Society of Professors of Education, and The John Dewey Society. A major interest in teacher education is their common bond with AACTE and among themselves.

AACTE is deeply concerned with and involved in the major education issues of the day. Combining the considerable resources inherent in the consortium--constituted through a national voluntary association--with strengths of others creates a synergism of exceptional productivity and potentiality. Serving as the nerve center and spokesman for major efforts to improve education personnel, the Association brings to its task credibility, built-in cooperation and communications, contributions in cash and kind, and diverse staff and membership capabilities.

AACTE provides a capability for energetically, imaginatively, and effectively moving the nation forward through better prepared educational personnel. From its administration of the pioneering educational television program, "Continental Classroom," to its involvement of 20,000 practitioners, researchers, and decision makers in developing the current *Recommended Standards for Teacher Education*, to many other activities, AACTE has demonstrated its organizational and consortium qualification and experiences in conceptualizing, studying and experimenting, communicating, and implementing diverse thrusts for carrying out socially and educationally significant activities. With the past as prologue, AACTE is proud of its history and confident of its future among the "movers and doers" seeking continuous renewal of national aspirations and accomplishments through education.

ABOUT ERIC

The Educational Resources Information Center (ERIC) forms a nationwide information system established by the U.S. Office of Education, designed to serve and advance American education. Its basic objective is to provide ideas and information on significant current documents (e.g., research reports, articles, theoretical papers, program descriptions, published and unpublished conference papers, newsletters, and curriculum guides or studies) and to publicize the availability of such documents. Central ERIC is the term given to the function of the U.S. Office of Education, which provides policy, coordination, training funds, and general services to 19 clearinghouses in the information system. Each clearinghouse focuses its activities on a separate subject-matter area; acquires, evaluates, abstracts, and indexes documents; processes many significant documents into the ERIC system; and publicizes available ideas and information to the education community through its own publications, those of Central ERIC, and other educational media.

Teacher Education and ERIC

The ERIC Clearinghouse on Teacher Education, established June 20, 1968, is sponsored by three professional groups--the American Association of Colleges for Teacher Education (fiscal agent); the Association of Teacher Educators, a national affiliate of the National Education Association; and the Division of Instruction and Professional Development, National Education Association. It is located at One Dupont Circle, Washington, D.C. 20036.

Scope of Clearinghouse Activities

Users of this guide are encouraged to send to the ERIC Clearinghouse on Teacher Education documents related to its scope, a statement of which follows:

> *The Clearinghouse is responsible for research reports, curriculum descriptions, theoretical papers, addresses, and other materials relative to the preparation of school personnel (nursery, elementary, secondary, and supporting school personnel); the preparation and development of teacher educators; and the profession of teaching. The scope includes the preparation and continuing development of all instructional personnel, their functions and roles. While the major interest of the Clearinghouse is professional preparation and practice in America, it also is interested in international aspects of the field.*

The scope also guides the Clearinghouse's Advisory and Policy Council and staff in decision making relative to the commissioning of monographs, bibliographies, and directories. The scope is a flexible guide in the idea and information needs of those concerned with pre- and in-service prepration of school personnel and the profession of teaching.

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